(No Model.)

2 Sheets—Sheet 1.

H. C. NICHOLSON.

ELECTRIC RAILWAY SIGNAL.

No. 329,478. Patented Nov. 3, 1885.

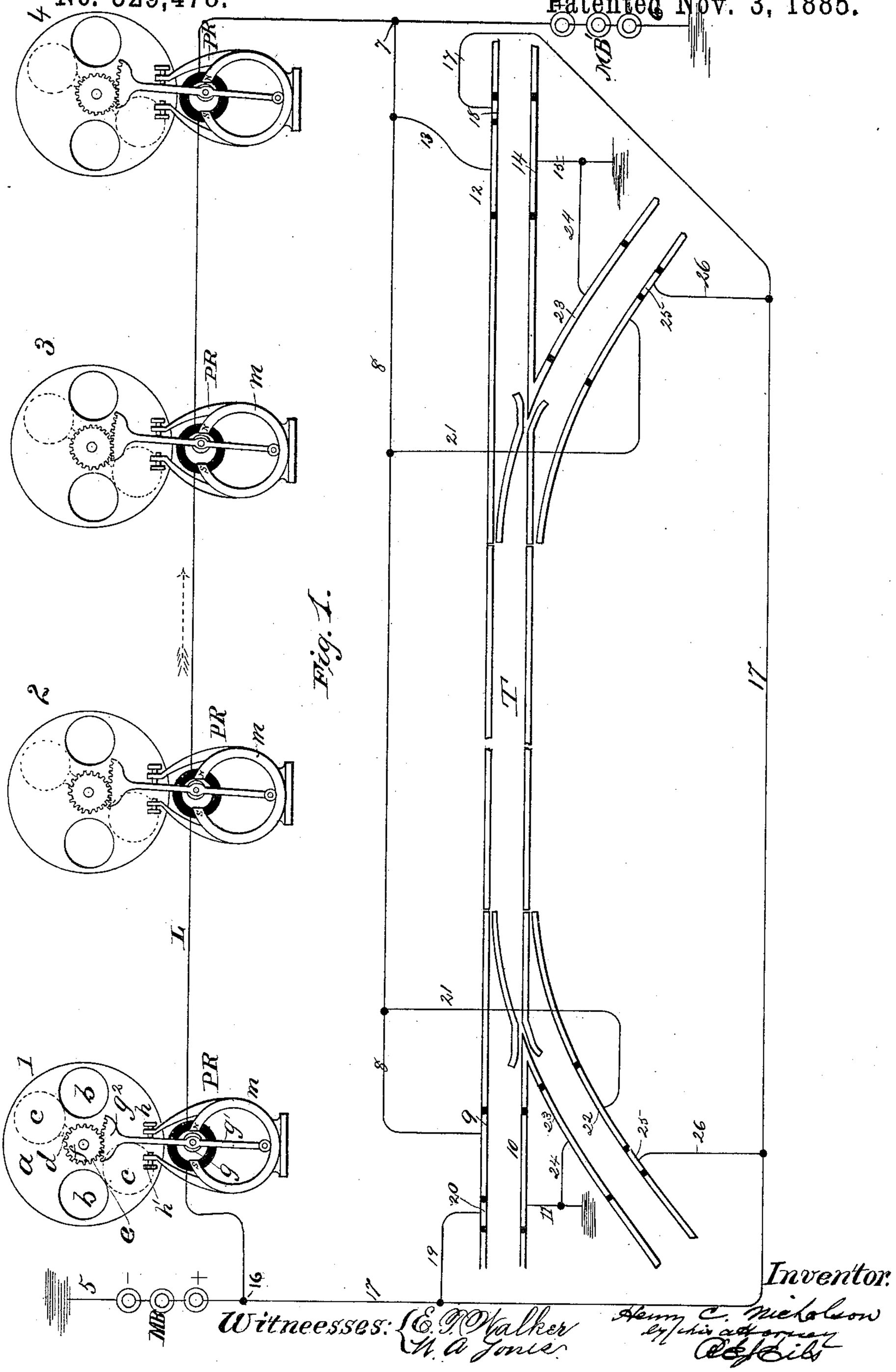

Fig. 1.

Witnesses: E. F. Walker, N. A. Jones.

Inventor: Henry C. Nicholson, by his attorney C. E. Foster

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.)

2 Sheets—Sheet 2.

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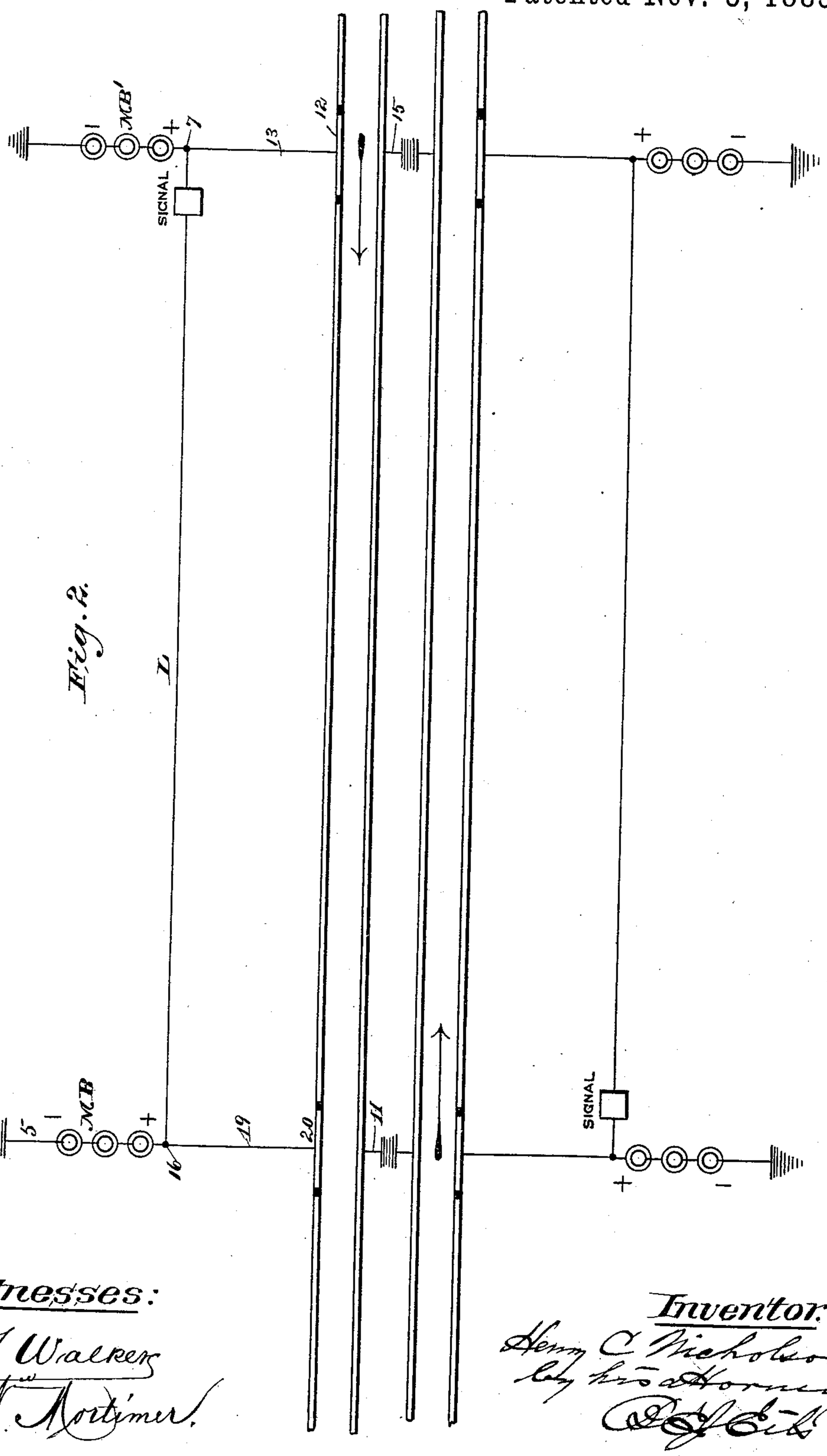

Fig. 2.

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E. T. Walker
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Inventor.
Henry C. Nicholson
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UNITED STATES PATENT OFFICE.

HENRY C. NICHOLSON, OF MOUNT WASHINGTON, OHIO.

ELECTRIC RAILWAY-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 329,478, dated November 3, 1885.

Application filed May 20, 1884. Serial No. 132,159. (No model.)

To all whom it may concern:

Be it known that I, HENRY C. NICHOLSON, a citizen of the United States, residing at Mount Washington, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Electric Railway-Signals; 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.

This invention is an improvement on the electric signal-circuits for railroads described in my United States Letters Patent No. 275,255, issued April 3, 1883.

It consists, mainly, in the combination, with the main-circuit which contains the relays for causing the operation of the signals, of two normally-open shunt-wires, one of which when closed operates exclusively to display the danger-signals, while the other when closed operates exclusively to display the safety-signals.

In order that my invention may be clearly understood, I have illustrated in the annexed drawings, and will proceed to describe, one practical form of my invention, showing it as applied to a signal-block on a main track entered by two side tracks, and a second form of my invention as applied to a double-track road.

Figure 1 is a diagram of the first above-mentioned form of my invention, and Fig. 2 is a diagram of the second form.

The signal-block illustrated in Fig. 1 contains four signals, marked, respectively, 1 2 3 4, each composed of a hollow disk, *a*, provided with two stationary safety-signals, *b b*, and two danger-signals, *c c*, attached to the opposite ends of a beam, *d*, located in the hollow disk and centrally secured to a shaft, *e*, by which the beam may be oscillated from a position in which the danger-signals are hidden and the safety-signals exposed to a position in which the danger-signals are exposed and cover the safety-signals. The shaft *e* carries a fast spur-wheel, *f*, which is engaged by a segmental rack, g^2, on the upper end of the lever g' of the soft-iron armature *g* of a polar relay, P R, composed of an insulated helix of wire, through which the soft-iron armature passes, and a pair of permanent reversed horse-shoe-magnets, *m*, one at each end of the helix. The armature-lever plays between stops *h* and *h'*. The helices of the polar relays are parts of the main line L of the main circuit, which main line connects similar—say the positive—poles of two equal batteries, M B and M B', grounded, respectively, by ground-wires 5 and 6, so that normally no current flows over the line. At post 7, at or near the positive pole of battery M B', and between said battery and the polar relay of signal 4, a shunt-wire, 8, is connected to the line L, and extends thence to the end of the signal-block adjacent to signal 1, where it is connected to an insulated rail-section, 9, of one side of the main track T, an insulated rail-section, 10, on the opposite side of the main track being grounded by wire 11. This shunt-wire 8 is also connected to an insulated rail-section, 12, of the main track by a wire, 13, at the end of the signal-block adjacent to signal 4 and opposite an insulated rail-section, 14, grounded by wire 15. At post 16, at or near the positive pole of battery M B, and between said battery and the polar relay of signal 1, a shunt-wire, 17, is connected to line L, and extends thence to an insulated rail-section, 18, located at the end of the signal-block next to insulated rail-section 12 and opposite to insulated rail-section 14. This shunt-wire 17 is also connected by a wire, 19, to an insulated rail-section, 20, at the end of the signal-block next to insulated rail-section 9 and opposite to insulated rail-section 10.

It will be observed that the moment a truck of a locomotive or car connects insulated rail-sections 9 and 10, or 12 and 14, the shunt-wire 8 establishes a shunt-circuit for each battery in such a manner that a current from battery M B will flow over the main line through all the polar relays, in the direction indicated by the dotted arrow, while the current from battery M B' will be diverted from the main line by said shunt-wire. In the example illustrated the relays are so constructed that this current will make that end of the armature which is shown in the drawings, a north pole, so that it will be repelled by the adjacent north pole of the permanent magnet and attracted

by the south pole thereof. Thus the armature-lever g' of each relay is moved from stops h to stops h', whereby the danger-signals are turned into view and the safety-signals covered up. As a locomotive or train leaves rail-section 9 or 12, in advancing in the signal-block, the normal condition of the circuits is re-established and the line-current vanishes, but no effect is thereby produced on the signals, because the armature-levers of the relays will remain resting against stops h', being held there by the superior magnetic attraction of the poles of the permanent magnets nearest the armatures, as well as by mechanical inertia. As the locomotive passes out of the block, say at the right hand end, its forward truck connects insulated rail-section 18 with grounded rail-section 14; but insulated rail-section 12 is so long that one or more of the trucks of the locomotive remain still on said rail-section 12; hence both shunt-wires 8 and 17 will be closed simultaneously, so that the current from battery M B′ will still be diverted from the main line by shunt-wire 8, and although the main portion of the current from battery M B will now also be diverted from the main line by shunt-wire 17, (since the resistance of the main line is superior, by reason of the relays in it, to the resistance of shunt-wire 17,) still a small portion of the current from battery M B will continue to flow over the main line and maintain a degree of polarization of the relay-armatures, so as to still cause the armature-levers to be held against stops h'. The armature-levers would remain resting against stops h', even though the whole of the current from battery M B were diverted from the main line. Therefore no change will be effected in the signals under the circumstances stated; but the moment the last truck of the outgoing locomotive, car, or train leaves rail-section 12 and connects rail-section 18 with rail-section 14 the whole of the current from battery M B is diverted from the main line by shunt-wire 17, and the whole of the current from battery M B′ flows over the main line to post 16, where it also enters the shunt-wire 17. The polarity of the relay-armatures is immediately reversed, and the armature-levers are moved from stops h' back to stops h, whereby the danger-signals are turned out of view and the safety-signals made visible. At all points where a side track is connected with the main track a signal should be placed so as to be visible from such side track. In order that trains passing from a side track onto the main track, and vice versa, may properly operate the signals along the main track, I connect shunt-wire 8 by a wire, 21, to an insulated rail-section, 22, in the side track at a point near the junction and opposite an insulated rail-section, 23, which is grounded by wire 24. Just beyond rail-section 22, but still opposite grounded rail-section 23, I place another insulated rail-section, 25, and connect it by a wire, 26, to shunt-wire 17.

It will be observed that the signals will be operated from the side track precisely in the same manner as they are operated from the main track, and that the danger-signals will remain exposed until the locomotive, car, or train has cleared the main track and passed wholly onto the side track.

I do not confine myself to the details of construction and arrangement shown and described, since they may be modified in many ways without departing from the essence of my invention. For instance, the relays, instead of operating the signals directly, may simply close local circuits provided with suitable means for operating the signals; relays of different style may be used; the location of the respective insulated rail-sections may be changed, &c.

On double-track roads, where all outgoing trains run on one track and all incoming trains on the other track, a single signal-operating electro-magnet only is required for each signal-circuit; and besides the main line the following conductors only—namely, wire 19, (then connected to post 16,) insulated rail 20, ground-wire 11, connected to a rail opposite rail 20, wire 13, (then connected to post 7,) insulated rail 12, and ground-wire 15 connected to a rail opposite rail 12. This arrangement is shown in Fig. 2.

I claim as my invention—

1. The combination, substantially as before set forth, of a closed main-line signaling-circuit containing two equal but opposed batteries, one at each end, and two independent normally-open shunt-wires, 8 and 17, connected to the circuit and with the track or tracks, substantially as described, so that said shunt-wires are adapted to be closed automatically by a locomotive or car, one of said shunt-wires, when closed separately, operating exclusively to cause the display of the danger-signals, and the other to cause the display of the safety-signals.

2. The combination, substantially as before set forth, of a main-line signaling-circuit containing two equal but opposed batteries, one at each end, a polarized relay (one or more) in the main line, signals operated by said polarized relay, and two normally-open shunt-wires connected to the main line and track or tracks, substantially as described, so that the closing of one shunt-wire causes a current to flow over the main line in one direction, effecting the display of a danger-signal, while the closing of the other shunt-wire causes a current to flow over the main line in the opposite direction, effecting the display of a safety-signal.

3. In combination with a main-line signal-circuit and an opposed battery at each end of the line, one or more oscillating signals connected to the armature working between the poles of a magnet, said armature having a coil connected in the main-line circuit, and two or more shunt-circuits connected to the main line and to an insulated rail, whereby two different signals are made by reversing the direction of currents sent over the main line

as either one of the batteries is cut out the main-line circuit and brought into the shunt-circuit by car-wheels passing over the insulated rails, substantially as before set forth.

4. In combination with the main track of a railroad and one or more switch-tracks, a main signal-circuit operated alternately by a battery at each end and a shunt for each switch or side track, said shunts connecting the track to the main signal-circuit, and one or more signals connected in the main line with the armature of a magnet, said circuit normally arranged to have no current, but adapted to be automatically electrically excited by the passing of train-wheels either upon the main or switch line bringing a shunt into circuit with one battery, whereby danger and safety signals are alternately brought into view as the respective shunt-circuits are brought into operation, substantially as before set forth.

5. The combination, substantially as before set forth, of a main-line signaling-circuit containing two equal but opposed batteries, one at each end, a polarized relay in the main-line circuit, signals operated by said polarized relay, and at each end of the circuit a normally-open connection from the main line to earth adapted to be closed automatically by a locomotive or car to short-circuit the adjacent battery.

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

HENRY C. NICHOLSON.

Witnesses:

C. A. NEALE,

E. T. WALKER.