(No Model.)

S. C. C. CURRIE.

ELECTRIC RAILWAY SIGNAL.

No. 384,962. Patented June 26, 1888.

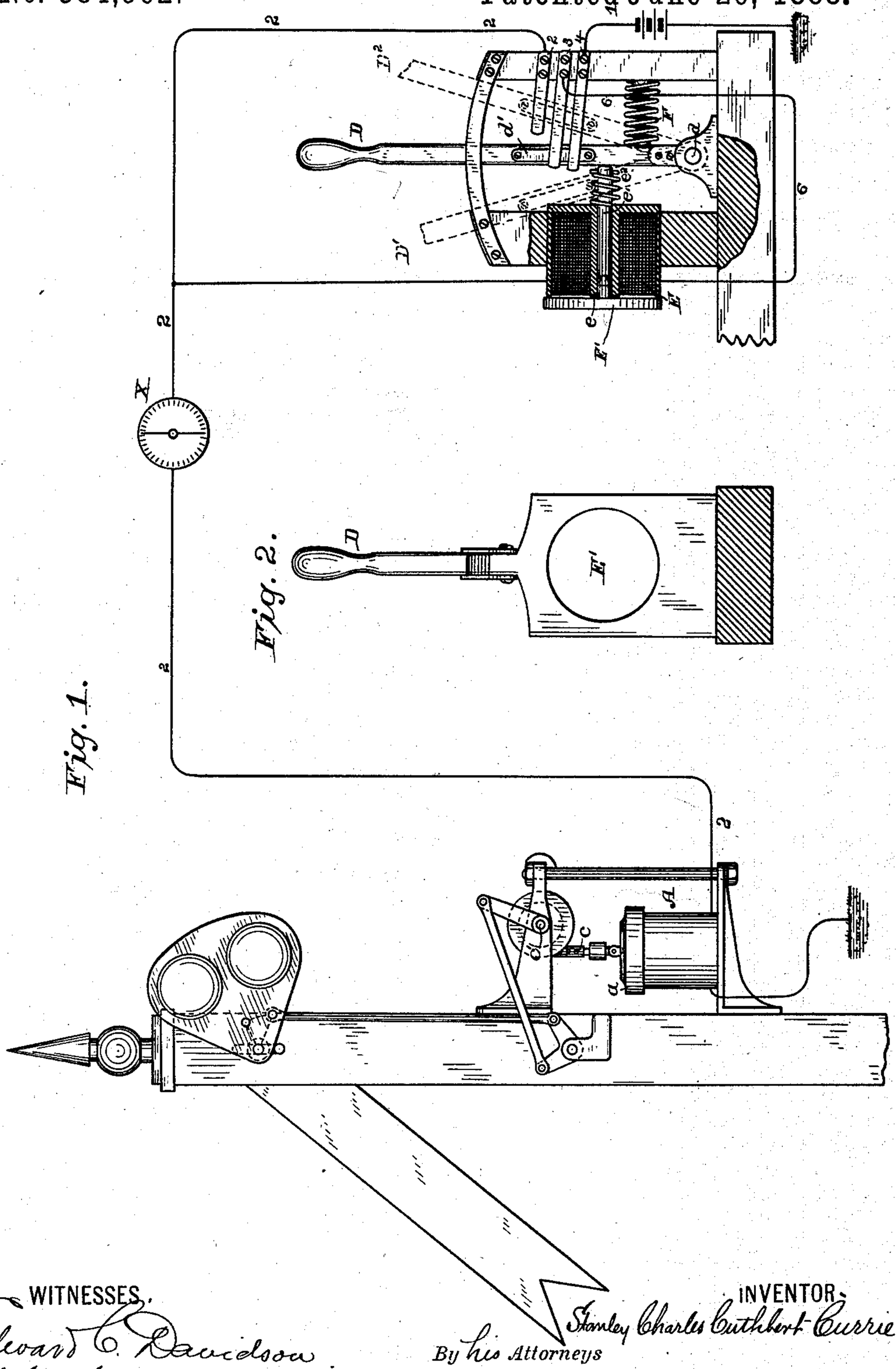

Fig. 1.

Fig. 2.

WITNESSES.
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ELECTRIC RAILWAY-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 384,962, dated June 26, 1888.

Application filed May 10, 1887. Serial No. 237,749. (No model.)

To all whom it may concern:

Be it known that I, STANLEY C. C. CURRIE, a subject of the Queen of Great Britain, and a resident of the city of London, in the county of Middlesex, England, have invented certain new and useful Improvements in Electric Railway-Signals, of which the following is a specification.

My invention relates to railway-signaling apparatus of the kind exemplified in United States Letters Patent to Timmis & Currie, respectively numbered, entitled, and dated as follows: No. 293,116, electro-magnet and armature, dated February 5, 1884, and No. 326,068, railway-signal, dated September 8, 1885. In this last-named patent an ordinary counter-balanced signal-arm swinging vertically on a pivot is shown as normally held at "danger" by the counter-balance, and as pulled down to "safety" by a magnet energized by a current controlled by a shifting-handle. When in its forward position—that is, with the signal at "danger"—its magnet is not energized. When pulled back to lower the signal to "safety," the full force of the current is exerted in lowering the signal. After the signal is lowered a slight forward movement of the shifting-lever shunts in a resistance which materially reduces the current and thus economizes power while holding the armature in proper relation to the magnet. The signal is released by moving the shifting-lever forward by hand, which breaks the current and allows the signal automatically to return to "danger" by the action of the counter-balance.

My improvements may be used in connection with other forms of apparatus; but are designed with special reference to that above described, which experience has demonstrated to be efficient.

The object of the first part of my improvements is to send a return signal from the one acted on to the switchman's station, which may be out of sight of the signal, which I do by interposing in the signal-actuating circuit an indicator, the needle of which is sufficiently "dead-beat," so that after being deflected through a certain distance by the passage of the main current it is again momentarily deflected in the opposite direction by means of the reactionary induced current which is produced when the armature of the actuating-magnet strikes "home," or, in other words, when the magnetic field of the magnet is short-circuited by contact of the armature on the poles.

The object of the next part of my improvements is to hold the shifting-lever after it has turned the signal to "safety" in its half-way position, or that in which the reduced current is flowing. This I do by interposing in the circuit a high-resistance magnet, in addition to the signal-actuating magnet, in such manner that when the shifting-lever is pulled back to actuate the signal the resistance-magnet is short-circuited and the full current flows through the signal-actuating magnet; but when the lever is half advanced the resistance-magnet is shunted in and the current flows through said resistance-magnet, (thereby being much reduced,) the armature of which holds the shifting-lever and signal at "safety."

The object of the next part of my invention is automatically to restore the shifting-lever to its normal position of "danger" when the signal is in that position, or when the current stops in the circuit from any cause. This I do by means of a spring acting on the shifting-handle, in opposition to the pull of the resistance-magnet.

My improvements further comprise certain novel organizations of instrumentalities for the more perfect working of my improved system.

The subject-matter claimed is particularly designated at the end of this specification.

The accompanying drawings represent all my improvements as embodied in one apparatus. Some of them may, however, be used without the others, and in apparatus differing in its details of construction from those of that herein shown, which, being well known and not claimed, will not be particularly described.

Figure 1 represents a diagrammatic view of the entire apparatus, and Fig. 2 an end elevation of the switch apparatus.

Circuit-wires 1 2 are shown as connecting a battery or other suitable generator of elec-

tricity with a magnet, A, preferably of the form shown in Letters Patent No. 293,116, above mentioned, which is called a "sucking" magnet—that is, one consisting of two concentric-tubes magnetically united and energized by an interposed insulated coil in the usual way and provided with a cup-shaped armature, the rim of which overlaps the top of the magnet, a central stem of the armature working in the cavity of the inner tube. The armature is shown as connected by a cord or chain, *c*, with a shaft or windlass, *c'*, from which a counterbalanced signal-arm is operated. The details of the signal-arm and its appurtenances are described in Patent No. 326,068, hereinbefore mentioned.

The circuit employed is preferably a closed one, and is utilized to hold the switch-lever in its intermediate position, as hereinbefore described.

The magnet-circuit is made and closed by a shifting-lever, D, which it is often desirable or necessary to locate out of sight of the signal-station. In such case it is highly important that the signal-shifter should know whether the signal is in proper position or not. To enable him to ascertain this fact with certainty, I arrange in the circuit near a station a calibrating-galvanometer or current-gage or other suitable well-known indicator, X. The signal normally stands at "danger," being counterbalanced or otherwise held in that position, so that it requires the positive action of the magnet to shift or pull it down to "safety." When the shifting-lever is pulled back, so as to energize the actuating-magnet and pull down the signal, the needle of my indicator is deflected through a distance sufficient for the purpose required. I find in practice ten degrees on a two-inch needle sufficient. It being "dead-beat," it becomes almost immediately stationary at the deflected point. As soon, however, as the armature *a* comes in contact with the magnet A a counter or reactionary current of momentary duration is set up in the circuit which actuates the galvanometer-needle, and thus indicates to the signal-shifter that the armature is home, and hence that the signal is properly set.

Of course, in addition to the above, I may frequently be required to use a repeater of the ordinary type to show the position of the signal-arm; but the above "dead-beat" indicator not only shows when the magnet-armature is home, but in so doing enables the signal-shifter to know when to let the shifting-lever go to the intermediate position—that is, when to switch in the resistance. Thus the maximum current need not be on longer than absolutely necessary to draw the armature down.

In this instance the shifting-lever is shown as moving in a vertical plane around a pivot, *d*. One side of this lever carries a plate, *d'*, of conducting material, which rubs against contact-plates 2 3 4, connected in the circuit. The two lower contact-plates, 3 4, it will be observed, are longer than the upper one, 2, and the upper and lower contact-plates, 2 4, are connected with the circuit-wires 1 2, while the intermediate one, 3, connects with a wire, 6, which runs through an electro-magnet, E, to the main-circuit wire 2.

When the shifting-lever is pulled back, as before remarked, to the position D^2, (shown in dotted lines,) the conducting-piece *d'* is in contact with the pieces 2 and 4, and consequently the full force of the battery flows through the circuit of the signal-magnet and pulls the lever down. As soon as this is done the lever is moved forward by hand to its intermediate position. (Shown in full lines in the drawings.) This movement is assisted by a compression-spring, F, the tension of which is sufficient, if unopposed, to throw the lever forward into its normal position D', which is that which it occupies when the signal stands at "danger." When the shifting-lever is in the intermediate position above described, the current flows through the contacts 4 3, thus including in the circuit the resistance-magnet E, which, as before remarked, is made of a high resistance, so as to reduce the current passing through it, say, from a full current of ten volts down to a current of one or two volts. This magnet is made with a tubular iron core, *e*, and iron end disks, and a disk-shaped armature, E', provided with a central spindle, *e'*, of brass or other non-magnetic material, and with a tension-spring, e^2, on the end next the lever, which spring tends to keep the spindle in contact with the lever and the armature in contact with the magnet. This spring is of much less strength than the one F, which acts in the opposite direction; but the spring and magnet combined are strong enough to hold the lever in its intermediate position when the current is flowing through the resistance magnet E. In place of springs I may use counter-weights.

Reducing the amount of current flowing through the magnet obviously effects a great economy, as the reduced current is sufficient to do the work required at the time.

It will be seen from the above description that when the lever is pulled back the signal-magnet is energized with a full current, and when the lever is moved to the intermediate position above described the current is shunted through the high-resistance magnet. To restore the signal to the "danger" position, the lever is shoved forward to its normal position, which releases it from all the contacts and breaks the circuit. Should the current stop from any cause while the lever stands either in its intermediate or back position, the spring F would at once overcome the resilience of the spring e^2 and force the lever forward into its normal position, thus setting the signal at "danger," at the same time forcing the armature E' away from its magnet. The advantage of this arrangement is obvious, as a number of shifting-levers and signals could be controlled from a common point by breaking the circuit with any well-known form of circuit-

controlling apparatus, the effect of which would be automatically to restore all the shifting-levers to their normal positions. The position of the switch would also serve as an indication of the position of the signal, and vice versa.

Having thus fully described the organization and operation of my improved electric railway-signal, what I claim therein as new, and desire to secure by Letters Patent, is—

1. The combination, substantially as hereinbefore set forth, of an electric railway-signal, its actuating-magnet and armature, its normally-open controlling-circuit, a shifting-lever making and breaking this circuit, and an indicator permanently connected with the switch-operating magnet in the controlling-circuit, whereby the indicator is actuated by a momentary return or reactionary current created by the contact of the signal-actuating magnet and its armature.

2. The combination, substantially as hereinbefore set forth, of the signal-actuating magnet, its controlling-circuit, the shifting-lever which makes and breaks this circuit, a high-resistance magnet in a shunt-circuit, and circuit-connections operated by the lever, all operating substantially as set forth—first to energize the signal-magnet, when the lever is pulled back, with the full current, short-circuiting the resistance, and then holding the shifting-lever in an intermediate position by the resistance-magnet, which is cut in as the shifting-lever is advanced.

3. The combination, substantially as hereinbefore set forth, of the signal-controlling circuit, the shifting-lever which makes and breaks it, the high-resistance magnet, which holds the shifting-lever in its intermediate position, and a tension-spring opposing the pull of the magnet automatically to restore the shifting-lever to its normal position when the current stops.

4. The combination, substantially as hereinbefore set forth, of the shifting-lever, the resistance-magnet, its spindle, and its encircling-spring interposed between the lever and magnet to keep the armature and magnet in contact and ready to act on the lever.

5. The combination, substantially as hereinbefore set forth, of the signal-controlling circuit, its contacts, the shifting-lever, the high-resistance magnet in the shunt-circuit, its protruding armature-spindle, and encircling-spring to keep the magnet-armature in position to act promptly against the shifting-lever when the latter completes the shunt-circuit by its forward movement.

6. The combination, substantially as hereinbefore set forth, of the signal-controlling circuit, its contacts, the shifting-lever, its forward-thrusting spring F, the high-resistance magnet in a shunt-circuit, its protruding armature-spindle, and encircling-spring automatically to throw forward the lever and separate the resistance armature and magnet when the circuit is broken.

7. The hereinbefore-described automatically-retracting railway-signaling apparatus, consisting of the combination, substantially as hereinbefore set forth, of an electric railway-signal, its actuating-magnet in a controlling-circuit, a shifting-lever controlling said circuit, an indicator to show when the signal is set, a resistance-magnet shunted in by the shifting-lever to reduce the current while the signal is stationary, and an actuating spring automatically shifting the lever to its normal condition when the circuit is broken and the signal reset.

8. The combination, substantially as hereinbefore set forth, of an electric circuit, a generator of electricity, an electro-magnet and its armature, its controlling-circuit, a railway-signal operated by the electro-magnet and armature, switch mechanism in the circuit for energizing the magnet, and an indicator in the same circuit with the magnet and permanently connected therewith, which indicates the return of the signal by means of the momentary return or reactionary current caused by the contact of the magnet-armature or short-circuiting of the field-magnet.

In testimony whereof I have hereunto subscribed my name.

STANLEY C. C. CURRIE.

Witnesses:
THOS. J. HUNT,
GEO. R. THOMPSON.