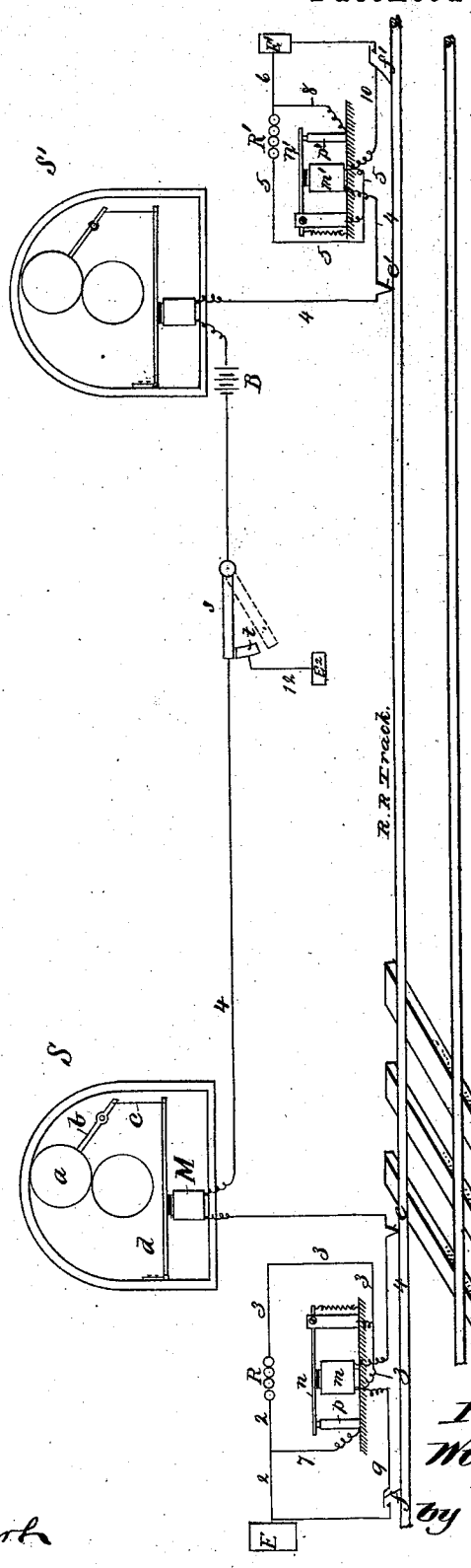
(No Model.)

W. HADDEN.

RAILWAY SIGNAL APPARATUS.

No. 273,515. Patented Mar. 6, 1883.



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UNITED STATES PATENT OFFICE.

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RAILWAY SIGNAL APPARATUS.

SPECIFICATION forming part of Letters Patent No. 273,515, dated March 6, 1883.

Application filed May 18, 1882. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM HADDEN, of Brooklyn, county of Kings, State of New York, have invented an Improvement in Railway Signal Apparatus, of which the following description, in connection with the accompanying drawings, is a specification.

My invention relates to a railway signal apparatus of that class in which the signals are normally retained in the "safety" position by the attraction of an electro-magnet, and moved to the "danger" position by the action of gravity or other retracting force when the said magnet is demagnetized, and is shown embodied in an apparatus in which resistance is introduced into the circuit when the signal-magnets are thus demagnetized—as by the breaking of the circuit—to reduce the strength of the magnets, so that they will not be able to restore the signals to their "safety" position when the circuit is again closed. In a former application filed by me May 1, 1882, I have shown the introduction of the said resistance into the circuit and its removal therefrom controlled by a polarized relay, itself governed by a pole-changing device operated by a magnet in the circuit to reverse the polarity of the current when the said armature is retracted.

The present invention consists in the combination, with the signal-magnets and their circuit, of an electric switch operated by an electro-magnet in the said circuit to control the introduction and removal of resistance, the said switch-magnet being itself controlled by the change in resistance of the line produced by it.

The invention further consists in the combination, with resistance located partly at each end of the section, and of such amount that when the resistance at both ends is introduced at the same time it renders all the magnets in the circuit unable to move their armatures but when that at one end only is in circuit it leaves the switch-magnet sufficiently powerful to move its armature, of branch circuits at either end of the said section, interposed between the said resistance on one side and the battery and the switch-magnet on the other side, and circuit-closers in the said branches, by which the effect of one portion of the said resistance is removed from the circuit, leaving it effected only by the other portion of the said resistance, and consequently permitting the said switch-operating magnet to move its armature, and thereby remove the resistance controlled by it from the circuit, and retain it thus removed until the circuit is again broken. As herein shown, two switch-magnets are employed—one with each portion of the resistance—their armatures being retracted when the circuit is broken, and thus interposing both portions of the resistance and preventing the armatures of the said switch-magnets and signal-actuating magnets from being moved up to the poles. When one portion of the resistance is removed it leaves the current sufficiently strong to attract both the switch-magnet armatures, thus removing both portions of the resistance and causing the current to act with full power upon the signal-actuating magnets.

The drawing shows in diagram a signal apparatus embodying this invention.

The signal apparatus S or S′, comprising the signal *a*, supported on an arm, *b*, connected by a link, *c*, with the armature-lever *d* of the main or actuating electro-magnet M, are all substantially the same as in my former application referred to, the weight of the signal *a* serving as a retractor for the armature of the magnet M.

The main circuit, which is normally closed, may be traced as follows: Beginning at the earth E, at one end of the section, it passes by wire 2 to the resistance R, from which it is continued by wire 3 to the switch-magnet *m*, and thence by wire 4, including the signal-actuating magnets M and the battery B, to the switch-magnet *m′* at the other end of the section, from which the circuit is continued by wire 5 to the resistance R′, and thence completed by wire 6 to the ground E′. The armature-levers *n n′* of the switch-magnets *m m′* are connected with the wires 3 and 5, respectively, between the adjacent resistance and the coils of the said magnets, and the said armature-levers are provided with contact-points *p p′*, with which they make connection when attracted. The said contact-points *p p′* are connected by wires 7 and 8, respectively, with the wires 2 and 6, between the resistance R R′ and the ground, so that when the armatures *n n′*

are attracted, this being their normal condition, a circuit is afforded from E to E′ by wires 2 7, point *p*, armature-lever *n*, wires 3 4 5, including the magnets and battery, armature-lever *n′*, contact-point *p′*, and wires 8 and 6, in which the current is not compelled to traverse and be weakened by the resistance R and R′, and the current of the battery B is of sufficient strength, when acting without the said resistance, to attract and retain attracted the armatures of all the various magnets included in the said circuit. When, however, the current is broken—as by the action of the circuit-breakers *e* or *e′* by a train entering the section from either end, as described in my other application—the magnets are all demagnetized, thus permitting the signals *a* to drop to the "danger" position and the armatures *n n′* to be removed from contact with the points *p p′*, so that when the circuit-breaker again closes, after the train has passed, the only circuit afforded between the wires 2 3 and 5 6 is through the resistance R and R′, respectively, thus weakening the current, so that none of the armatures will be attracted, and the signals will consequently remain in their "danger" position.

When desired to restore the signals to their "safety" position it is necessary to remove the whole or one portion of the resistance R R′. This is accomplished by means of branch circuits 9 10, connected with the wires 3 and 5, respectively, and with the ground, the said branch wires being provided with normally-opened circuit-closing instruments *f f′*, arranged to be operated by the trains after they have passed the adjacent circuit-breakers *e e′* in leaving the section. When either one of the said circuit-closers is operated by a train leaving the section at either end a circuit is afforded through the branch wire, as 9, to the wire 3, magnet *m*, and thence by wire 4 to the other end of the section, as before described, over which the current passes without being compelled to traverse and be weakened by that portion of the resistance adjacent to the circuit-closer and branch thus operated, and the switch-magnets *m m′* are so adjusted that their armatures will be attracted when one portion of the said resistance is removed from their circuit, thus connecting the armatures *n n′* with the points *p p′*, and affording a direct circuit therethrough between the wires 2 and 3 and 5 and 6, as before described, so that the battery acts with full effect upon the signal-actuating magnets M.

It will be understood that the signal-actuating magnets may also be properly constructed or adjusted to move their armatures when the current passes through only one portion of the resistance, but not when it passes through both portions, in which case one of the switches, with its operating-magnet, might be omitted, the wire 4, for instance, being connected directly with the wire 3, and the wire 7, with the parts *m n p*, being omitted; but it is preferable to employ both switches, so that the signal-actuating magnets M will be affected by the full power of the current. When desired to operate the signals otherwise than by the instruments *e e′ f f′*, automatically operated by the train, this can be done by any suitable circuit-controlling switch, as the one *s*, the said switch connecting the portion of the line 4 that includes the battery B with the ground, and thus removing the portion of the resistance which is located at the other end of the said wire 4. The anvil-piece *t* of the said switch is connected by the wire 12 with the ground E^2, and in moving it from the dotted to the full line position, for the purpose of closing the main line 4, a circuit is afforded for the switch-actuating magnet *m′*, including only the resistance R′, at the same end of the section, so that its armature will be moved up, thus cutting the said resistance out of the circuit, and consequently causing the armature of the other switch-magnet, *m*, to be moved up as soon as the switch closes the main line, which it does before being actually disconnected from the anvil-piece *t* and the ground.

It is obvious that a wire from E to E′, connected with the wire 12 or anvil-piece *t*, might be employed if a wholly metallic circuit is desired.

I have spoken of the resistance as being cut out or removed from the circuit when an additional direct circuit is afforded, as the resistance then has no tendency to weaken the current, as is the case when no such additional direct circuit is afforded.

I claim—

1. The combination, with the signal-actuating electro-magnets, of a switch-operating electro-magnet, and resistance interposed in the circuit of the said switch-operating magnet by the movement of its armature when retracted upon the opening of the circuit, whereby the said armature is retained retracted after the subsequent closure of the said circuit, substantially as described.

2. The main signal-controlling electric circuit and switch-operating electro-magnet therein, combined with resistance in two portions, one located near each end of the said section, one of the said portions being interposed in the said circuit by the armature of the said magnet when retracted, and a branch circuit between one portion of the said resistance and the battery with the said magnet, whereby the said battery is caused to act upon the said magnet unaffected by the said resistance when the said branch circuit is closed, substantially as described.

3. The main signal-controlling electric circuit and two switch-operating electro-magnets therein, combined with resistance, one portion of which is introduced into the circuit by the armature of each of the said magnets when retracted, the said resistance and magnets being adjusted as described, whereby when the entire resistance is in circuit the said armatures remain retracted, but when either portion of the said resistance is removed the said arma-

tures are attracted, and thus remove the entire resistance, substantially as described.

4. The combination of the signal-actuating magnets, the switch-magnets and resistance interposed in circuit thereby, the circuit-breakers, and branch circuits and circuit-closers therein, whereby the said resistance is removed from the circuit of the said switch-magnets, and is retained thus removed by their consequent operation, substantially as described.

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

WILLIAM HADDEN.

Witnesses:
WILLIAM H. CLARKSON,
HERMAN SULING.