(No Model.)

W. HADDEN.

RAILWAY SIGNAL APPARATUS.

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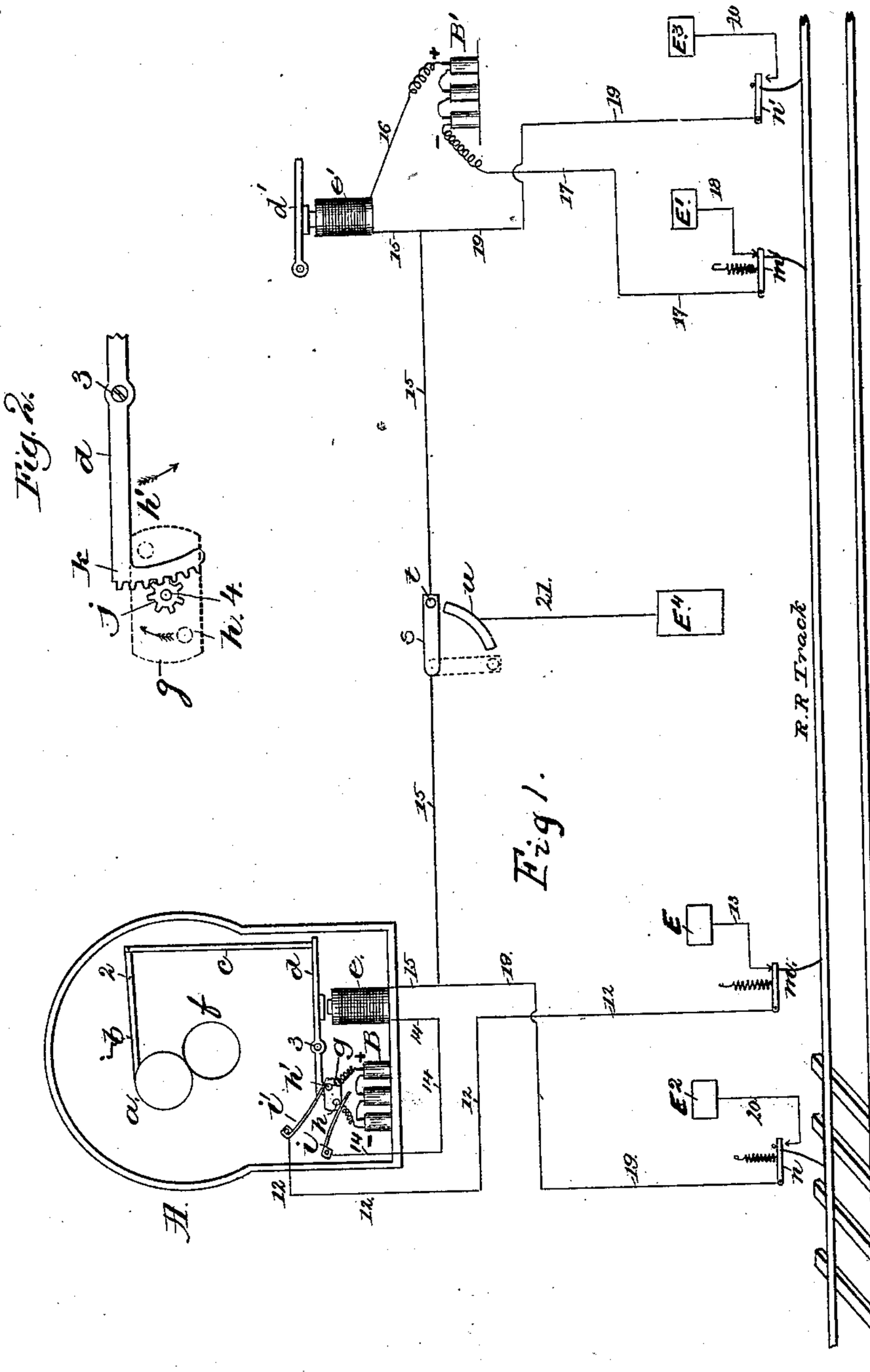

Witnesses.
John F. C. Brinkerhoff
Bernice J. Noyes.

Inventor
William Hadden
by Crosby & Gregory Atty's.

UNITED STATES PATENT OFFICE.

WILLIAM HADDEN, OF BROOKLYN, ASSIGNOR TO THE AMERICAN RAILWAY SIGNAL COMPANY, OF NEW YORK, N. Y.

RAILWAY SIGNAL APPARATUS.

SPECIFICATION forming part of Letters Patent No. 273,516, dated March 6, 1883.

Application filed April 7, 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.

This invention relates to railway signal apparatus of that class in which the signal is normally retained in the "safety" position by the action of an electric current in a normally-closed electric circuit, the signal being set to "danger" by the action of gravity when the said current is interrupted, as by a circuit-breaker operated by a train entering the block-section guarded by the said signal.

The object of my present invention is to provide means for preventing the return of the signal after the circuit which has been broken to set the signal to "danger" is again closed until the train passes off the section, and also to provide means for causing the signal to return to and remain in its normal or "safety" position when the train finally does leave the section.

The invention consists partly in the combination, with the signal and its actuating electro-magnet and armature, of a divided actuating-battery in circuit with the said magnet, and a pole-reversing device for one portion or section of the said battery operated by the said signal or armature, and arranged to set the said portion of the battery in opposition to the other portion when the said armature is retracted, so that the two portions will neutralize one another, and will have no tendency to cause the magnet to again attract the armature and move the signal.

The invention also consists in the employment, with the devices last described, of means to complete an independent circuit for one or both portions of the said battery through the said signal-actuating magnet, so that the said portion of the battery is no longer neutralized, and consequently produces its effect on the magnet which attracts the armature to its poles, and the latter in its movement operates the pole-changing device, restoring the said portion of the battery to its normal condition in conjunction with the other portion, the combined current of the two sections thus acting to retain the armature attracted until the magnet is again demagnetized by breaking the circuit of the combined battery, or otherwise interrupting the electric current or removing it from the magnet.

The invention also consists in the combination, with one or more signal-actuating magnets and the divided batteries and circuits and pole-changing device described, of circuit breakers and closers operated automatically by the passing train, and of hand-operated circuit closers for causing the movements of the signal and armature and the consequent reversals of the polarity of one portion or section of the battery.

Figure 1 is a diagram illustrating this invention; Fig. 2, a detail showing the pole-changing device enlarged.

The signal *a* is shown as the usual colored disk, mounted on a lever, *b*, pivoted at 2, and connected by a link, *c*, with the armature-lever *d*, pivoted at 3, of an electro-magnet, *e*, which, when magnetized, retains the said lever against the action of gravity upon the signal *a*, which tends to draw the armature-lever *d* away from the magnet, and thus acts as a retractor. Thus when the said magnet *e* is demagnetized the signal *a* falls by its own weight into proper position to be seen through the opening *f* of the inclosing-case A. One signal only is shown in full; but the circuits and instruments are arranged to set signals at both ends of the block-section simultaneously, as is required upon a single-track road, the magnet *e'* and armature-lever *d'* only of the second signal being shown, as it is substantially the same as the one shown in full. The armature-lever *d* of one of the signals is arranged to operate a pole-changing device, *g*, shown in this instance as consisting of a block of insulating material mounted to rotate on an arbor, 4, (see Fig. 2,) and provided with pins *h h'*, connected with the poles of a battery, B, and resting in contact with springs *i i'*, forming the terminals of the circuit external to the said battery. The said block is provided with a pinion, *j*, actuated by a gear, *k*, connected with the armature-lever *d*, as shown in Fig. 2, so that when the said armature-lever is retracted upon the demagnetization of the magnet *e*, as before

described, it will rotate the said block in the direction of the arrow until the pin h' is brought into contact with the spring i and the pin h in contact with the spring i' thus reversing the connection of the poles of the battery with the circuit external thereto in a well-known manner. The springs $i\ i'$ follow the pins $h\ h'$ in their movement, so that the circuit is not broken between the said pins and springs. The spring i' is connected by wire 12 with a normally-closed circuit-breaker, m, normally in contact with a wire, 13, connected with the ground at E. The spring i is connected by a wire, 14, with the magnet e, from which the circuit is continued by wire 15 to the magnet e' of the signal at the other end of the section, from which the circuit is continued by wire 16 to one pole of the battery B', the other pole of which is connected by wire 17 with a circuit-breaking instrument, m', normally connected by wire 18 with the ground at E'.

It is obvious that the wires 13 18 might be connected by another wire or metallic conductor, instead of being connected with the ground.

It will be seen that in the circuit just described from E to E' the two batteries B B' act in conjunction, and may be considered as sections of a single battery. When the said circuit is broken, as at m or m', by the action of a train entering the section from either end, the said circuit-breaker being of any well-known kind adapted to be operated automatically by the train passing, the magnets $e\ e'$ are demagnetized, permitting their armatures to be retracted by the signals which fall to the "danger" position, and in this movement the armature-lever d causes the position of the pole-changing device g to be reversed, so that the section of the battery B no longer acts in conjunction with but opposes the section B', so that the current is neutralized, and the magnets $e\ e'$ are not magnetized when the circuit-breaker m or m' is subsequently closed after the passage of the train, the signals consequently remaining in the "danger" position. The signals are subsequently restored to the "safety" position at the proper time when the train leaves the section in the following manner: The conductor 15 is connected by wires 19 with normally-open circuit-closing instruments n and n', one located at each end of the block-section, and properly arranged to be operated by the train leaving the said section after it has passed the circuit-breaking instrument m or m' at the same end of the section, the said instruments $n\ n'$ being provided with anvil-pieces connected by wires 20 with the ground at E^2 E^3, respectively. The wires 19 20 thus form a normally-open branch circuit, which, when closed, will form a complete circuit for the section B of the battery, independent of the section B' thereof, and including the magnet e. The section B of the battery, thus acting unopposed by the section B' upon the magnet e, will cause the latter to attract its armature, and in the movement thereof the pole-changing device g will be restored to its normal position (shown in Fig. 1,) thus bringing the section B of the battery into conjunction with the section B' in the circuit between E E', so that the two sections, acting in conjunction, will retain the signal in its normal or "safety" position after the circuit-closing instrument n or n' has been restored to its normally-open condition. It will be seen that at the same time that the independent circuit of the section B of the battery is completed—for example, by closing the instrument n from the ground E^2 by wires 20, 19, 15, and 14, and the spring i and pin h' to one pole of the said battery, and thence by pin h, spring i', wire 12, circuit-breaking instrument m, and wire 13, to the ground E—an independent circuit will also be formed for the section B' of the battery from the ground at E', by conductors 18 m' 17 16, magnet e', wires 15 and 19, to the same instrument n, wire 20, and ground at E^2, so that the magnet e' will be affected simultaneously with the magnet e by the closure of the said instrument n. The operation is the same when the instrument n' is closed by the train passing off the section in the other direction.

If desired, the signals may be set to "danger" by circuit-breakers other than the ones $m\ m'$, located at any point in the circuit from E E'—as, for instance, by the electric switch s in the wire 15. When the said switch s is moved off from its button t and the anvil-piece u, as shown in dotted lines, the circuit is open, and the signals consequently indicate "danger." The anvil-piece u for the said switch is connected by wire 21 with the ground at E^4, so that in closing the said switch it connects the wire 15 from the magnet e with the wire 21 and ground at E^4, thus completing the circuit for the section B of the battery from the ground E, by conductors 13 m 12 i' h h' i 14 e 15 s u 21, to the ground at E^4, magnetizing the magnet e and setting the signal to "safety," and at the same time changing the connection of the poles of the section B of the battery, so that when the switch s passes from the anvil-piece u to the button t, which it does before leaving the anvil-piece u, the two sections of the battery act in conjunction, retaining the signal in the "safety" position and magnetizing the magnet e', so that the other signal immediately follows and is retained in the "safety" position.

The sections B B' of the battery are shown as of equal strength; but it is obvious that one—preferably the one B—may be stronger than the other, the essential point being that when acting in opposition the current is not sufficient to attract the armatures and move the signals. For a double-track road, where it is necessary to set a signal at one end only of the section, the same construction could be employed with the omission of certain parts, namely: The circuit-closing instrument n and the wires 19 20, connected therewith might be omitted. The magnet e' and the entire sig-

nal operated thereby might be omitted, the wire 16 being continuous with the wire 15, and the wire 17 would be connected directly with the ground at E′, the instrument *m′* being omitted.

A single wire connecting together the wires 13 18 20 21 might be substituted for the ground-connections with the said wires, if desired to have the circuit wholly metallic.

Any other form of pole-changing device might be employed for reversing the connections of one section of the battery with the external circuit, the said device being operated by the signal or its actuating-armature in any convenient manner.

The present invention is not limited to any special construction of the mechanism employed, as it is obvious that it can be greatly varied.

The circuit-controlling instruments *m* and *n* are not herein specifically described, as numerous instruments adapted for this purpose have been previously described and used, any of which may be employed in carrying out the present invention.

I claim—

1. The signal-operating electro-magnet and divided battery and circuit-breaker in circuit therewith, combined with a pole-changing device operated by the said signal in its movement, which takes place when the circuit is broken, whereby the position of one portion of the said battery in the said circuit is reversed and it operates to neutralize the current of the other portion, substantially as and for the purpose described.

2. The signal-operating electro-magnet, divided battery in circuit therewith, and pole-changing device for one portion of the said battery operated by the said signal, combined with a circuit between the two portions of the said battery, and a circuit-controlling device therein, whereby one portion of the battery is caused to act independently, and its polarity is changed in the consequent movement of the signal, substantially as described.

3. The signal-operating electro-magnet and divided battery and normally-closed circuit-breaker in circuit therewith, combined with a pole-reversing device for one portion of the said battery, operated by the said signal in its movements caused by the said magnet, and a normally-open branch circuit and circuit-closer therein between the two portions of the battery, substantially as described.

4. The signal-actuating electro-magnet and divided actuating-battery in circuit therewith, combined with a pole-reversing device for one portion of the said battery, operated by the said signal, as described, whereby when the signal is in one position the two portions of the battery are opposed to one another and when in the other position they act in conjunction, substantially as described.

5. The signal-operating electro-magnet, divided battery in circuit therewith, and pole-changing device for one portion of the said battery, operated by the said signal in its movements, combined with an electric switch in the said circuit, and a branch circuit for the said portion of the battery, having an anvil or contact-piece engaged by the said switch in its movement by which the main circuit is closed, substantially as described.

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

WILLIAM HADDEN.

Witnesses:
JOS. P. LIVERMORE,
JOHN D. GOULD.