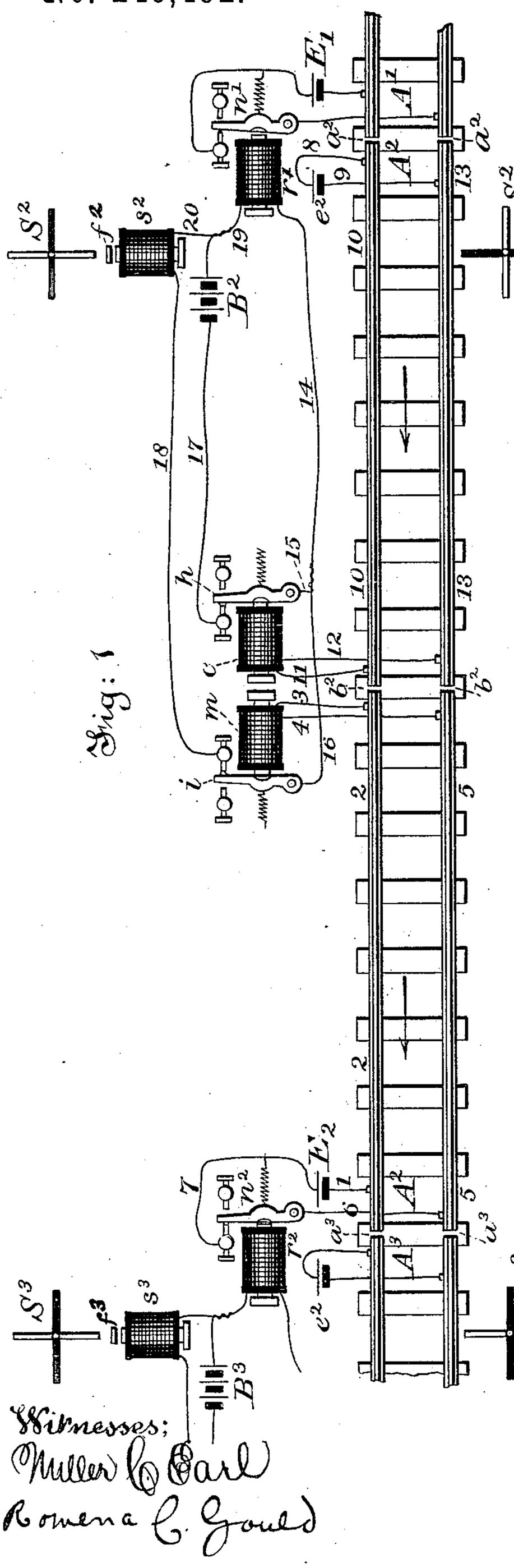
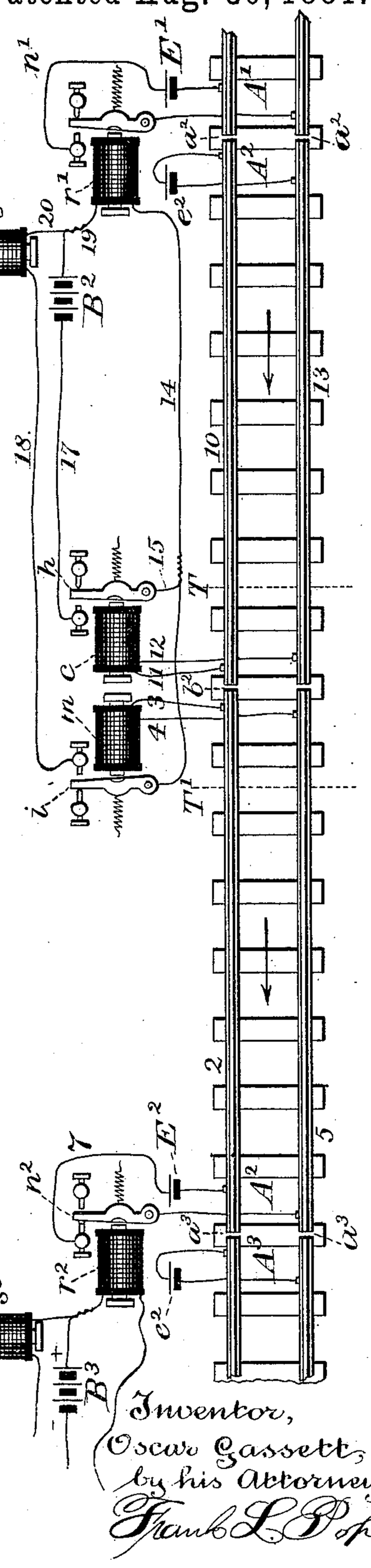
(No Model.)

O. GASSETT.

ELECTRIC RAILWAY SIGNALING APPARATUS.

No. 246,492. Patented Aug. 30, 1881.





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ELECTRIC RAILWAY SIGNALING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 246,492, dated August 30, 1881.

Application filed December 21, 1880. (No model.)

To all whom it may concern:

Be it known that I, OSCAR GASSETT, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Electric Railway Signaling Apparatus, of which the following is a specification.

My invention relates to that system of automatic electric railway signaling apparatus which consists in dividing the whole or a portion of the length of a line of railway into signal-sections of any required or convenient length, (which length corresponds to the minimum interval of space which it is desired to preserve between different trains moving upon the same track,) and in guarding each of said sections by a signal placed at or near the entrance of such section, which signal is actuated or controlled by electro-magnets included in electric circuits extending the entire length of the signal-section to which it appertains, said electro-magnets being, in turn, controlled through the electric circuit by a movable circuit-closer attached to the train. By this means the passage of a train over each successive signal-section causes a danger-signal to be exhibited at the entrance of such section from the time that the train enters it at one end until it leaves it at the opposite end, when the danger-signal is withdrawn or discontinued, leaving the way clear for the next succeeding train.

It has been found in practice that it is frequently desirable and necessary to continue a given danger-signal in action after the train which sets it in action has passed off from the section which the signal is designed to guard and until such train has passed over the next section in advance, or a certain portion thereof, by which an additional security is provided, especially upon dangerous portions of the road, such as sharp curves or descending grades.

In Letters Patent of the United States No. 233,746, granted to me October 26, 1880, I have described and claimed a combination of electric circuits and apparatus in which the several circuits appertaining to the different signal-sections, instead of being entirely independent of each other, as in the ordinary arrangement, are made to act to a certain extent dependently, so that while each signal is, as heretofore, under the direct control of a train which is traversing the section appertaining thereto, it is also under the indirect control of the same train through the agency of the next signal-circuit in the series during the time in which the said train is traversing a certain portion of the next signal-section.

My present invention consists of an improved organization of circuits and apparatus whereby the same result may be obtained in a more reliable and efficient manner.

In the accompanying drawings, Figure 1 is a diagram illustrating the application of my invention to a railway-track, showing one complete signal-section with its accompanying electric circuits and apparatus in a normal position of rest; and Fig. 2 shows the same in the act of being operated by the passage of a locomotive or train.

In Fig. 1, A^2 A^2 represent one of the series of signal-sections into which the railway is divided. These sections are usually, in practice, from one to two miles in length. A portion of one of the adjacent signal-sections in each direction is shown at A' and A^3. At the entrance of each signal-section with reference to the direction in which the trains move, as indicated by the arrow, is placed a signal, as at S^2 and S^3. The particular mechanical construction of these signals is immaterial, as they may be of any of the well-known forms employed for such purposes.

I have shown, for the sake of illustration, a signal consisting of two vanes or wings at right angles to each other and mounted upon a vertical spindle. One of the vanes is colored and signifies "danger," while the other vane is white and signifies "safety." By causing the spindle to turn upon its axis, either the white or the colored vane may be placed at right angles to the direction of the track, so as to be visible to the engineer of an approaching train, while at the same time the other vane will stand edgewise, so as to be practically invisible.

By means of an organization of electric circuits which will be hereinafter explained, a locomotive or train, entering upon the signal-section A^2 at the end nearest the signal S^2, causes the said signal to assume a position with its colored vane (signifying "danger") at

right angles to the line of the track, and the signal will remain in this position as long as the train occupies any portion of the signal-section. The action of the signal is also continued by means of special devices for that purpose while the train is passing over a certain portion of the next adjacent section ahead. Therefore, if any accident should occur which should stop a train just after it had entered upon a signal-section, a following train will be warned, not alone by the signal of that section, which may be too near to enable the following train to be stopped in time, but in addition by the signal at the entrance of the first-named section, a mile or more farther back. The manner in which this result is effected will be explained by reference to the diagrams, Figs. 1 and 2; and it may be stated that the apparatus about to be described in connection with one signal-section is similar to that upon all the other signal-sections, and that the same arrangement is duplicated for a double-track railroad.

The signals S^2 and S^3 may be constructed in the manner hereinbefore referred to, or they may be of any other suitable or convenient construction. The signals may be actuated directly by the armatures f^2 and f^3 of the electro-magnets s^2 and s^3, or by trains of wheels driven by weights or springs and controlled by the armatures, or in any other well-known manner, the only essential condition being that the mechanism shall be so controlled by the electro-magnet as to exhibit a safety-signal whenever the said magnet is in a magnetic condition and a danger-signal whenever the same is demagnetized.

The opposite lines of rails of the signal-section A^2 A^2 are insulated from those of the adjacent section in each direction by means of suitable insulated splices, a^2 a^2 and a^3 a^3, the construction and arrangement of which are well understood and need no detailed description in this place. Additional insulated splices b^2 b^2 are inserted in both lines of rails at some suitable intermediate point of the signal-section, whereby each signal-section is divided into two sub-sections, constituting two complete circuits, which are electrically independent of each other.

At the left-hand or forward end of the signal-section A^2 A^2 is placed a battery, E^2, the opposite poles of which are connected by conductors 1 and 6 with the respective lines of rails 2 and 5, while at the other or rear end of the forward sub-section the terminals 3 and 4 of the electro-magnet m are connected with the respective lines of rails in a similar manner. Each line of rails is connected together at the joints, so as to form a continuous electric conductor extending from one end to the other of each sub-section.

E' represents the corresponding battery of the adjacent signal-section, arranged in the same way.

A circuit-breaker, n^2, controlled by an electro-magnet, r^2, is placed in the circuit of one of the conductors connecting the battery E^2 with the lines of rails 2 and 5. The remaining sub-section of the signal-section A^2 A^2 is also provided with a battery, e^2, connected to the opposite lines of rails 10 and 13 at the rear end of the sub-section, while at the forward end thereof the terminals of the electro-magnet c are connected with the said respective lines of rails, so as to form a continuous and unbroken circuit at all times through both rails of the sub-section from the battery e^2 to and including the electro-magnet c. The circuit-breaker n^2 of section A^2 is kept closed by an electro-magnet, r^2, which is itself controlled in like manner by the apparatus of the adjacent signal-section A^3. In like manner the circuit-breaker n' of section A' is controlled by the electro-magnet r', which is itself controlled by the apparatus of section A^2 in a manner which will now be explained in detail.

B^2 is a voltaic battery of sufficient power to actuate or control the signal S^2 by means of the electro-magnet s^2. One pole of this battery—for example, the negative pole—is connected by the wire 17 with a circuit-breaker, h, which is kept closed so long as the magnet c is in a magnetic condition. From the circuit-breaker h a branch wire, 15, leads to the wire 14, which is connected with one terminal of the electro-magnet r'. The other terminal of this magnet is connected by wire 19 with the other pole of the battery B^2. Another branch, 16, leads from the wire 14 to the circuit-breaker i, which is kept closed by the electro-magnet m when the latter is in a magnetized condition, and from this circuit-breaker i the wire 18 leads to one terminal of the electro-magnet s^2, the other terminal of the latter being connected by a wire, 20, to the positive pole of the same battery B^2. B^3 is the corresponding battery of the adjacent section, arranged in a similar manner.

When the apparatus is in its normal condition and no train is on either of these signal-sections, as shown in Fig. 1, each subdivision of the signal-section A^2 forms a continuously-closed circuit. The electro-magnet m is charged by a current from the battery E^2, which passes over the wire 1, through the line of rails 2 and wire 3, to electro-magnet m, thence, by wire 4, line of rails 5, wire 6, circuit-breaker n^2, and wire 7, to the other pole of the battery E^2. In like manner a constant current from the battery e^2 traverses the wire 8, line of rails 10, wire 11, electro-magnet c, wire 12, line of rails 13, and wire 9. Thus the electro-magnets c and m are normally kept in a continuously-magnetic condition; hence the circuit-breakers h and i are kept closed, and consequently both the secondary branch circuits from the battery B^2, which respectively include the electro-magnets r' and s^2, are also kept closed. The effect of this arrangement is that the signal S^2 is maintained in a position indicating "safety" by the electro-magnet s^2, while the circuit-breaker n'

is also closed, thus maintaining the continuity of the circuit on the adjacent section A′. The circuit of the battery E^2 of the section under consideration is closed in like manner by the electro-magnet r^2 of the succeeding section, and so on throughout the entire series of signal-sections. This arrangement therefore constitutes a series or chain of normally-closed signaling-circuits, each circuit covering one sub-section of the insulated track, which latter in each case forms part of the signaling-circuits between its battery and electro-magnet. There are two sub-sections in each signal-section, and therefore there are twice as many signaling-circuits as signal-sections. A circuit-breaker is placed in each alternate signaling-circuit of the series, as at n' and n^2, and these circuit-breakers are placed under control of electro-magnets included in the adjacent intermediate signaling-circuit. Thus the circuit-breaker n' is controlled by the electro-magnet c of the adjacent circuit and the circuit-breaker n^2 by the electro-magnet of the next circuit of the series. (Not shown in the figure.) Thus it will be understood that an interruption of the constant current of either the batteries E^2, e^2, or B^2 will cause the electro-magnet s^2 to be demagnetized and the signal S^2 to be placed in a position denoting "danger." Such an interruption might occur from a failure of one of the batteries to act properly, or from the breakage of a wire or one of the rails of the track, the removal or displacement of a rail, or any similar cause. In any such case the signal must necessarily assume a position indicating "danger."

The manner in which the signals are successively actuated by a moving train is as follows: Referring to Fig. 2, let it be assumed that a train has entered upon the signal-section A^2 A^2 and occupies the position indicated by the dotted line at T, or any position between the insulated splices a^2 a^2 and b^2 b^2. The wheels and axles of the train constitute a movable circuit-closer which has practically no electric resistance and which forms a connection between the two opposite lines of rails of the track. The current of the battery e^2 will now be diverted from the electro-magnet c and will pass across at T from the rail 10 to the rail 13. The electro-magnet c will be demagnetized, breaking the circuit of the electro-magnet s^2 at h, which will thereupon become demagnetized, and a danger-signal exhibited at S^2, as shown in Fig. 2, thus guarding the entrance to the section A^2 in the rear of the train. The circuit of the electro-magnet r' is also interrupted at the same instant by the circuit-breaker h, thus releasing the circuit-breaker n' and breaking the signal-circuit of the rearward section and exhibiting a danger-signal at the entrance of that section also. This latter signal will continue to be exhibited until the train T has passed wholly beyond the insulated splices b^2 b^2, as indicated by the dotted line T′, when a connection will be formed, in the manner hereinbefore described, between the rails 2 and 5. The current of the battery E^2 will now be diverted from the electro-magnet m, which will become demagnetized and release the circuit-breaker i, thus interrupting the circuit of the electro-magnet s^2 at the point i before it is closed at the point h, which latter operation cannot take place until the entire train has passed beyond the point b^2. The closing of the circuit at h actuates the electro-magnet r', and thus restores the safety-signal at the entrance of the rearward section, A′.

By a repetition of the above-described series of operations upon the succeeding signal-section A^3 the danger-signal at S^2 will continue to be exhibited in like manner until the advancing train has reached the point corresponding to b^2 on the advance signal-section A^3, when it will be restored to a position indicating "safety." Thus it will be understood that the danger-signal of each signal-section is automatically exhibited during the passage of a train over that section by reason of the successive shunting and the consequent demagnetization of the electro-magnets c and m, and that the exhibition of a danger-signal is continued during the passage of the same train over a certain portion—viz., the adjacent sub-section—of the next signal-section ahead, in consequence of the interruption of the circuit by means of a circuit-breaker controlled by the train while traversing the last-named sub-section.

The insulated splice b^2 may be placed at any desired point between A^2 and A^3, according to circumstances. In practice it is usually preferable to place it at a distance from the point a^2 at the entrance of the section which is equal to the maximum distance required in order to stop a train which has passed the signal S^2 at full speed, and therefore the proper distance will necessarily be determined by the circumstances of the particular location.

I claim as my invention—

1. The combination, substantially as hereinbefore set forth, of a series of normally-closed railway signaling-circuits, each of said circuits including a battery, an electro-magnet, and a section of insulated railway-track forming part of said circuit between the battery and the electro-magnet, with circuit-breakers placed in each alternate circuit of the series, and not in the intermediate circuits, each of which circuit-breakers is controlled by an electro-magnet included in the adjacent intermediate circuit.

2. The combination, substantially as hereinbefore set forth, of a series of normally-closed railway signaling-circuits, a circuit-breaker placed in each alternate circuit of the series, which is controlled by an electro-magnet included in the adjacent intermediate circuit and a series of electro-magnets for actuating signals, each of which is under the control of three successive signaling-circuits.

3. The combination, substantially as hereinbefore set forth, of a secondary circuit for actuating an electro-magnet controlling the movements of a signal, two independent circuit-breakers placed in said secondary circuit, and two independent primary signaling-circuits, respectively controlling the action of the said circuit-breakers, which primary circuits are themselves actuated successively by a train while traversing the signal-section protected by said signal.

4. The combination, substantially as hereinbefore set forth, of two independent primary signaling-circuits which are acted upon successively by a train while traversing a signal-section, two independent circuit-breakers controlled respectively by the said primary circuits when so acted upon by the train, an electro-magnet for actuating a signal which is included in a secondary circuit under the control of both of said circuit-breakers, and an electro-magnet for actuating the signal of an adjoining signal-section which is included in a secondary circuit under the control of one of said circuit-breakers, but not under the control of the other.

In testimony whereof I have hereunto subscribed my name this 14th day of December, A. D. 1880.

OSCAR GASSETT.

Witnesses:
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