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C. P. BREESE.

AUTOMATIC ELECTRIC RAILWAY SIGNAL SYSTEM.

No. 515,648 Patented Feb. 27, 1894.

Fig. 1.

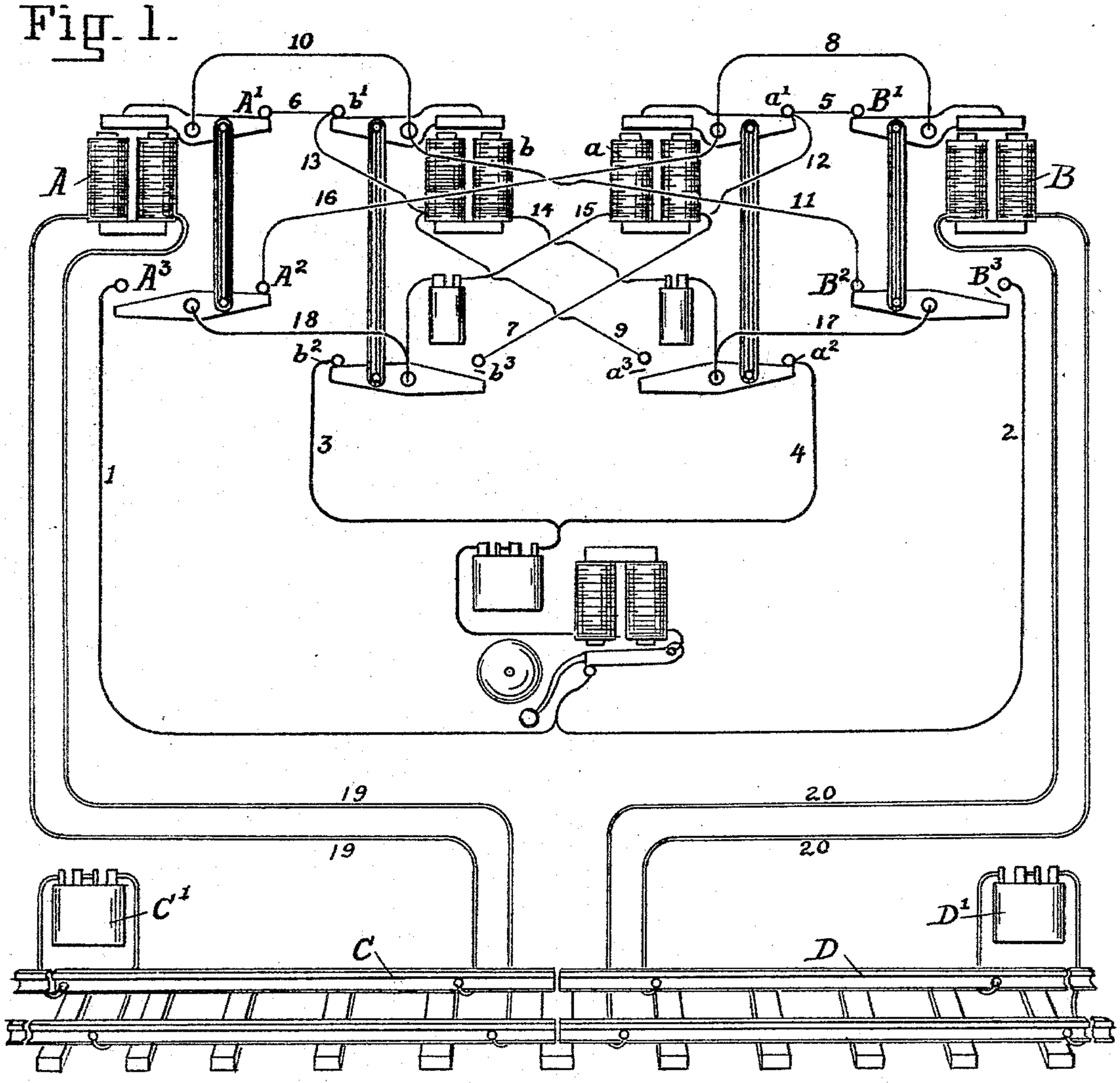

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Fig. 2.

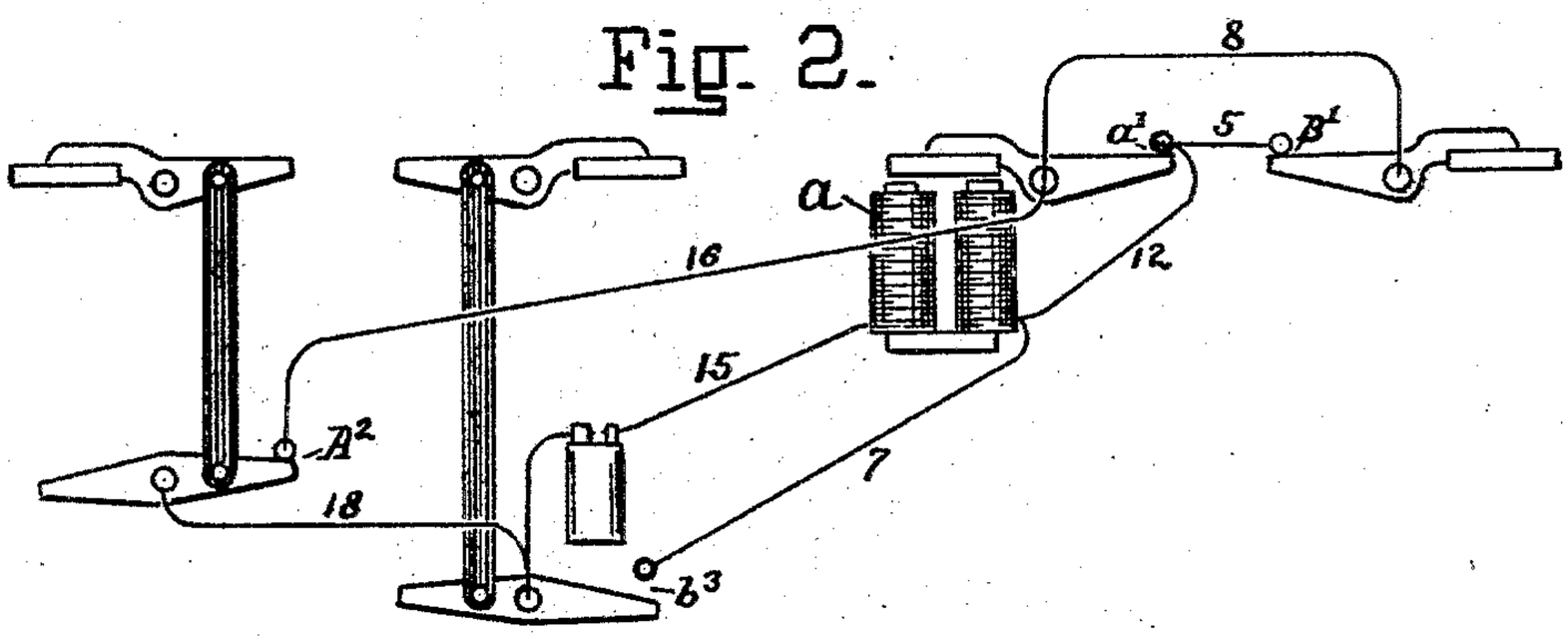

Fig. 3.

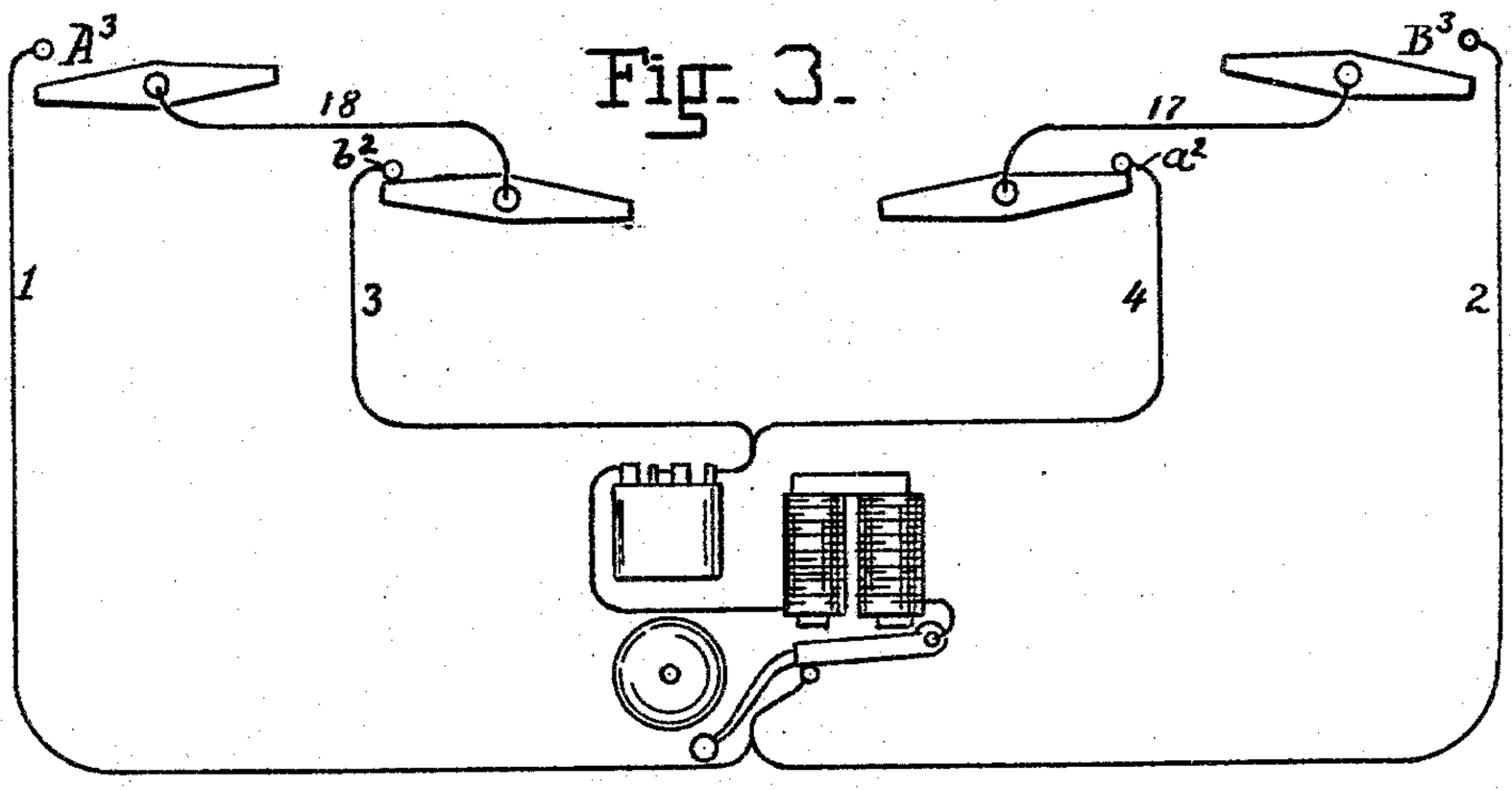

Fig. 4.

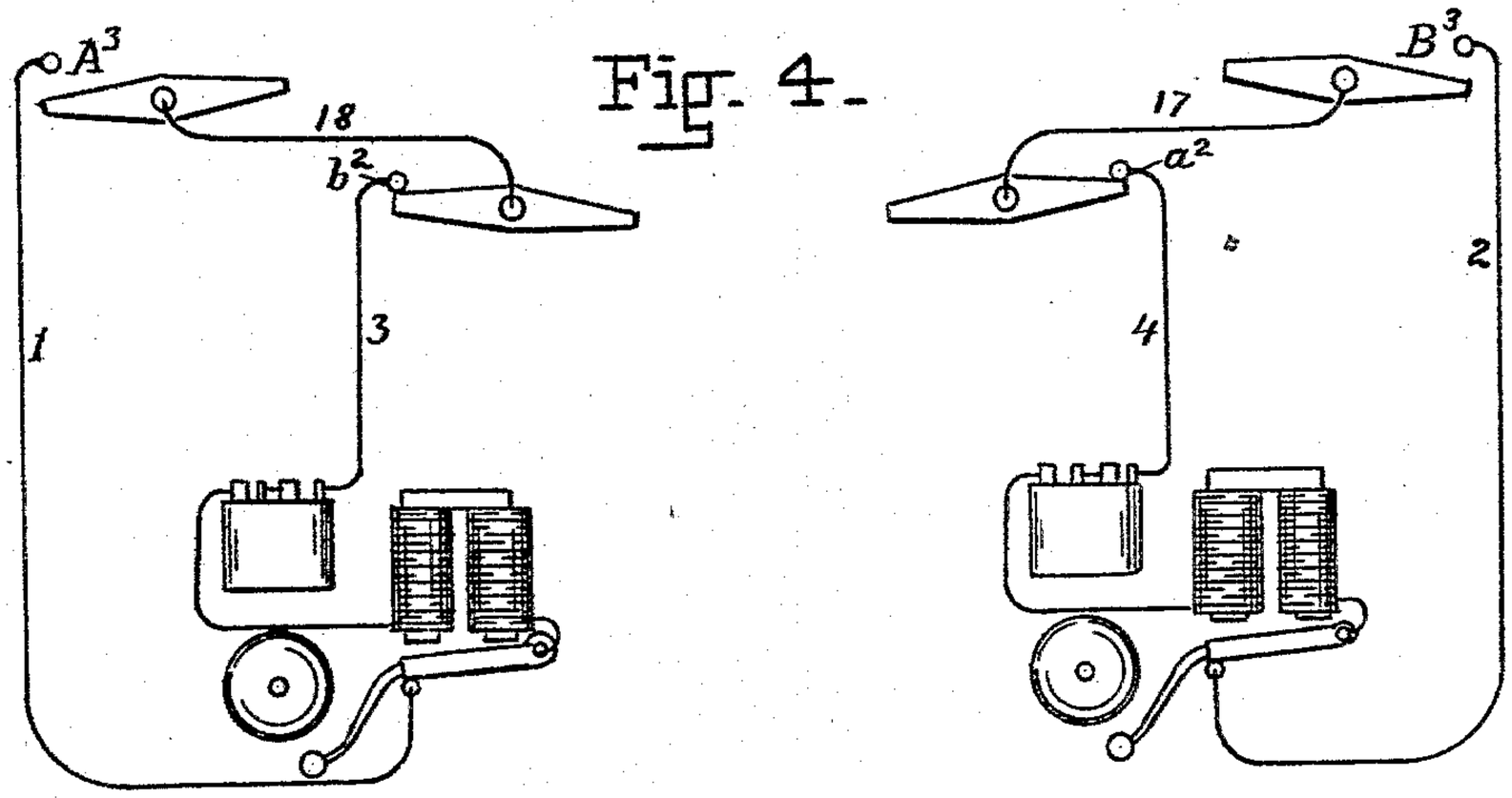

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Fig. 5.

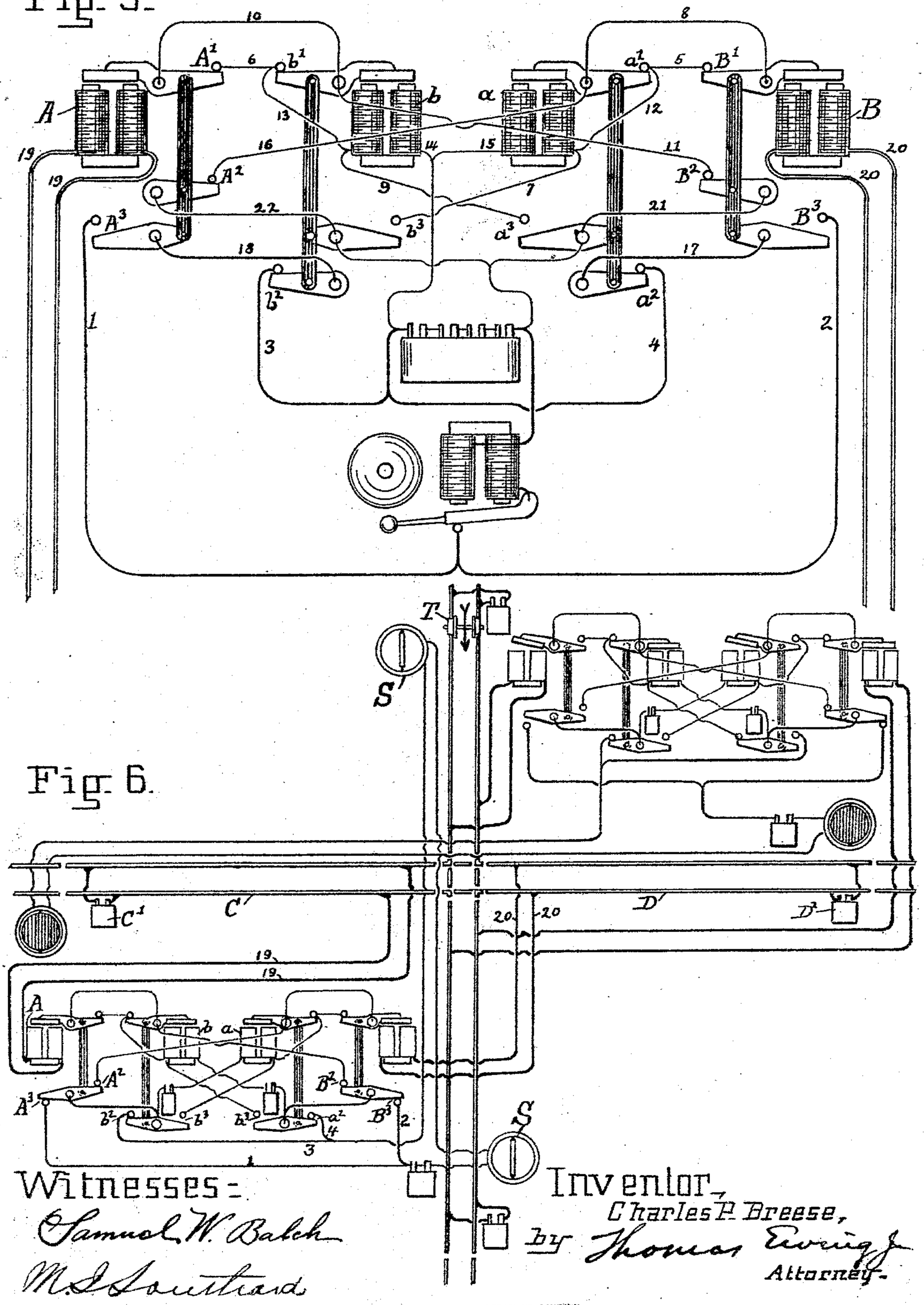

Fig. 6.

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UNITED STATES PATENT OFFICE.

CHARLES P. BREESE, OF NEW YORK, N. Y., ASSIGNOR TO THE HALL SIGNAL COMPANY, OF SAME PLACE.

AUTOMATIC ELECTRIC RAILWAY SIGNAL SYSTEM.

SPECIFICATION forming part of Letters Patent No. 515,648, dated February 27, 1894.

Application filed March 22, 1893. Serial No. 467,155. (No model.)

To all whom it may concern:

Be it known that I, CHARLES P. BREESE, a citizen of the United States of America, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Automatic Electric Railway Signal Systems, of which the following is a specification.

The object of my invention is to secure an alarm or other signal which will give a warning as a railway train, going in either direction, is approaching and passing a certain point irrespective of whether the track ahead and within the limit of the signaling system is cleared or occupied by a preceding train.

To effect this object my invention consists of an electrical system in which there are two adjacent track-sections of desired length and insulated from each other, lying on opposite sides of the signaling point, each connected with an electromagnet or its equivalent, the two electromagnets being independent of each other, but controlling circuits of such arrangement that the actuation of one of the electromagnets by a train entering either section will operate the signal, whether the other section is clear or occupied by a preceding train, and the operation of the signal will continue until the section first entered is cleared, when it will cease. And it further consists in a system in which there are two track-sections connected with two track-section magnets independent of each other and of the rest of the system, two relay magnets, one for each of the track-section magnets and a signal controlled by the four magnets, the arrangement being such that the actuation of either track-section magnet operates one of the relay magnets, that the operation of one of the relay magnets prevents the contemporaneous operation of the other, and that the return of a relay-magnet to normal condition is impossible until the two independent magnets are brought contemporaneously to normal condition. And it further consists in such a system controlling a signal in such manner that the signal is operated whenever one of the track-section magnets is actuated, the relay of the other track-section magnet being contemporaneously in normal position. And it further consists in certain details hereinafter described and claimed.

In the accompanying drawings which form a part of this specification, Figure 1 shows the system as adapted to a single track. Fig. 2 is a detail of the circuits through the relay-magnet *a*. Fig. 3 is a detail of the circuits through the bell. Fig. 4 shows a modification introducing two bells and bell circuits. Fig. 5 is a modification in which the number of batteries is reduced, and Fig. 6 shows the system slightly modified from Fig. 1, and applied to a crossing of railway tracks.

In all the figures except the upper right hand system of Fig. 6 all the parts are shown in their normal position *i. e.* in the position they occupy when the tracks are clear. The track-sections are insulated from each other, and the two sides of the same track-section are insulated from each other except as they are connected through their respective batteries and electro-magnets.

Two magnets A B, herein called track-section magnets, are connected independently of each other, one with the rails of one track-section and the other with the rails of the other track-section. In circuit with each magnet and track-section is a separate local battery C′, D′, the connection between the track battery, magnet, and track-section being by wires 19 19 and 20 20. When a train enters either track-section the battery of that section is short-circuited by the car-trucks and the track-section magnet in the circuit thus shunted drops its armature or armatures.

In the description which follows it will be assumed that the train approaches the signaling point on the same side with track-section C (Fig. 1). The same description is applicable if the approach is from the other side, it being necessary only to substitute magnet B in the one case for magnet A in the other and similarly relay *b* for relay *a*, and the corresponding connecting wires. The bell should ring from the time a train enters one section until that section is cleared whether the other section is cleared or occupied by a preceding train.

The contacts $A' A^2 A^3$ are all controlled by the armature of the track-section magnet A

and A′ A^2 are opened and A^3 is closed when this magnet is short-circuited by a train on the track-section. In like manner the contacts B′ B^2 B^3 are all controlled by magnet B. The contacts a' a^2 a^3 are all controlled by the armature of the relay-magnet a, and a' a^2 are opened and a^3 is closed when a is demagnetized. In like manner the contacts b' b^2 b^3 are controlled by relay-magnet b.

Referring now to Figs. 1, 2 and 3 when magnet A is shunted by a train entering track-section C, and its armature drops closing contact A^3 and opening contacts A′ and A^2, the bell circuit is closed at A^3 and the bell begins to ring. The circuit of relay-magnet a to wit, magnet a, wire 15, battery, wire 18, contact A^2, wire 16, contact a' and wire 12, is at the same time broken at A^2, causing the armature of relay-magnet a to drop. The opening of contact A′ produces no effect. The function of this contact, will appear later from the statement of the function of contact B′.

By reference to Fig. 3 it will be seen that the signal bell will ring only when A^3 and b^2 or B^3 and a^2 are simultaneously closed, *i. e.* only when A is demagnetized and b is magnetized or B is demagnetized and a is magnetized. The bell circuit is thus controlled by either track-section magnet and the relay of the other track-section magnet jointly. This bell circuit is compound, having two branches which are as follows: battery, bell, wire 1, contact A^3, wire 18, contact b^2, and wire 3; and battery, bell, wire 2, contact B^3, wire 17, contact a^2, and wire 4 When the armature of relay-magnet a is released, closing contact a^3 and opening a' and a^2, the second branch of the bell circuit is broken at a^2 and the subsequent closing of contact B^3 will not be sufficient to close this branch of the bell circuit, the object of which is to prevent the signal from being operated by the train after it has passed off from section C, as will appear later. At the same time circuit to wit, magnet b, wire 9, contact a^3, battery, and wire 14, is closed at its only breaking point a^3 so that so long as a is demagnetized b will remain magnetized.

The foregoing bell circuits and all the other bell circuits shown in this application are entirely without control over the track section and relay magnets. This is of great advantage since it secures the greatest latitude in the selection of a signal, which may be a vibrating or single tap bell, a visual signal, pair of gates or of any other desired form.

By reference to Fig. 2 it will be seen that relay-magnet a is in a compound circuit having three branches, to wit: that one already traced which includes contact points A^2 and a' and is therefore controlled by magnet A and relay-magnet a jointly; the branch, relay-magnet a, wire 15, battery contact point b^3 and wire 7, controlled by b alone; and the branch, relay-magnet a, wire 15, battery, wire 18, contact point A^2, wires 16 and 8, contact point B′, wires 5 and 12, controlled by magnet A and magnet B jointly. The first and third branches are normally closed but are broken simultaneously at contact point A^2 when a train enters track-section C. When the first branch is broken at contact point A^2 it is also then broken at contact point a' and since relay-magnet b is and remains magnetized so long as relay-magnet a is demagnetized the armature of relay-magnet a cannot be restored to normal position by closing the second branch at b^3. The only other way that this restoration can be effected is by the simultaneous closing of A^2 and B′ which occurs only when both sections are cleared and the whole system returns to normal condition. Since a^2 is open so long as there is a train on either track-section going in the direction under discussion there can be no current in the branch of the bell circuit which includes this contact point. Since b^2 is closed so long as relay-magnet a is demagnetized and A^3 is closed so long as magnet A is shortcircuited, the bell will ring so long as track-section C or both of the track-sections are occupied. And this is true whether a single train overlaps the two sections or there be a separate train on each of them. But since so soon as the train has traversed the track-section C and leaves it cleared, contact A^3 is opened, the bell will cease to ring as soon as the train passes the joint of the section, if no following train has entered section C.

As above stated the system operates similarly if the train passes the signaling point from the other direction, in which case the bell will commence to ring when the train enters track-section D and will cease to ring when the train leaves it as will be clear from the above explanation if magnets B b their contacts and connections are substituted for magnets A a their contacts and connections respectively.

If bells are placed in the line of wires 1 and 2 as shown in Fig. 4, the ringing of one bell will indicate that a train is approaching from one direction and the ringing of the other bell will show that a train is coming from the other direction. These wires may lie in independent circuits with separate batteries as in this figure or they may be branches from a single battery as in Fig. 1.

Fig. 5 shows how the system discussed in Fig. 1 may be modified so as to consolidate the two relay batteries and the bell battery. To effect this some changes of circuits are required. The connections to the contacts A^2 and A^3, a^2 and a^3, b^2, and b^3, B^2 and B^3, are separated. The magnets are mutually dependent upon each other as before and the bell rings in the same way. The circuits of magnets A and B and the bell circuits are as before. The circuits of relay magnet a are as follows: first branch, battery, contact A^2 contact a', magnet a; second branch, battery, contact A^2, contact B′, magnet a; and third branch, battery, contact b^3, magnet a, just as in circuit shown in Fig. 1, and in detail in Fig. 2.

Fig. 6 shows a system substantially as in Fig. 1, in duplicate, and applied to each of two crossing railroad tracks. The wiring is varied from the above figure in two particulars. Loops from the wire extending between the junctions of wires 1 2 and 3 4 are extended each way from the crossing along the track which crosses the one to which the system is connected. Signals S S in series occupy the ends of these loops. I prefer to employ signals constructed for a normally closed circuit, whereas the bell in the system as shown in Fig. 1 is for a normally open circuit. The modifications for this purpose, which are the only differences that in any way affect the circuits, consist in the reversal of the contacts A^3 and B^3, so that they are normally closed, instead of being normally open as in Fig. 1. Merely for clearness of drawing, the signal battery is shown as lying between the signals and the junction of wires 1 and 2, whereas in Fig. 1 it lies between the bell and the junction of wires 3 and 4. The square formed by the rails at the crossing is not shown as a part of the electrical system. These latter points of difference are immaterial. The system of Fig. 5 might obviously be substituted for Fig. 1.

When a train enters a section, as at T, and thereby causes the armature of the corresponding track-section magnet to drop, the contact A^3 or B^3 controlled by it is opened, the signals by the other track are set to danger, and remain so until the train has traversed the section first entered and has left it clear, as before explained.

In the claims I use the term operation or its allied terms, applied to one of the magnets, to indicate the effecting of change in the magnet from its normal condition, namely, that condition in which it is when the whole system is at rest and cleared, to its abnormal condition, by which is meant its condition after it has been operated to effect the operation of the signal.

It will be obvious from the foregoing that many modifications may be made without departing from the spirit of my invention

Without limiting myself to the details shown, what I claim is—

1. A railway signal system consisting of two independent track sections, two track section magnets, two relay magnets, and circuits in which are provided means for effecting the operation of a track section magnet on the occupation of the corresponding track section in all conditions of the rest of the system, means for effecting the operation of a relay magnet on the operation of a track section magnet if the rest of the system is in normal condition, means for preventing the operation of one of the relay magnets when the other is in operated condition, means for preventing the return to normal condition of a relay magnet when once operated except upon return of the whole system to normal condition, in combination with a signal circuit having two branches, or two signal operating circuits, one of which is controlled by one of the track section magnets and one of the relay magnets jointly, and the other of which is controlled by the other track section magnet and the other relay magnet jointly, substantially as described.

2. A railway signal system consisting of two independent track sections, two track section magnets, two relay magnets, and circuits in which are provided means for effecting the operation of a track section magnet on the occupation of the corresponding track section in all conditions of the rest of the system, means for effecting the operation of a relay magnet on the operation of a track section magnet if the rest of the system is in normal condition, means for preventing the operation of one of the relay magnets when the other is in operated condition, and means for preventing the return to normal condition of a relay magnet when once operated except upon return of the whole system to normal condition, in combination with a signal circuit having two branches, or two signal operating circuits, one of which is controlled by one of the track section magnets and one of the relay magnets jointly, and the other of which is controlled by the other track section magnet and the other relay magnet jointly, so that both branches or both signal operating circuits cannot be brought simultaneously into condition to operate the signal, substantially as described.

3. A railway signal system consisting of two independent track sections, two track section magnets, two relay magnets, and circuits in which are provided means for effecting the operation of a track section magnet on the occupation of the corresponding track section in all conditions of the rest of the system, means for effecting the operation of a relay magnet on the operation of a track section magnet if the rest of the system is in normal condition, means for preventing the operation of one of the relay magnets when the other is in the operated condition, and means for preventing the return to normal condition of a relay magnet when once operated except upon return of the whole system to normal condition, in combination with a signal circuit having two branches, or two signal operating circuits, one of which is controlled by one of the track section magnets and one of the relay magnets jointly and the other of which is controlled by the other track section magnet and the other relay magnet jointly, either branch or signal operating circuit being brought into condition to operate the signal by operating the corresponding track section magnet if the rest of the system is in normal condition, substantially as described.

4. A railway signal system consisting of two independent track sections, two track section magnets, two relay magnets, circuits in which are provided means for effecting the operation of a track section magnet on the occu-

pation of the corresponding track section in all conditions of the rest of the system, means for effecting the operation of the relay magnet on the operation of a track section magnet if the rest of the system is in normal condition, means for preventing the operation of one of the relay magnets when the other is in the operated condition, and means for preventing the return to normal condition of a relay magnet when once operated except upon return of the whole system to normal condition, in combination with a signal circuit having two branches, or two signal operating circuits, one of which is controlled by one of the track section magnets and one of the relay magnets jointly and the other of which is controlled in the same manner by the other track section magnet and the other relay magnet jointly, so that both branches or both signal operating circuits cannot be brought simultaneously into condition to operate the signal, either branch or signal operating circuit being brought into condition to operate the signal by operating the corresponding track section magnet if the rest of the system is in normal condition, substantially as described.

5. In a railway electrical signaling system the combination of two track-sections, two independent magnets, (as A or B,) one electrically connected with one and the other with the other of the track-sections, a relay magnet, as *a* or *b*, for each of said independent magnets, in a compound circuit, one branch of which is controlled by the relay-magnet itself (*a* or *b*) and the said independent magnet (A or B) jointly, another branch of which is controlled by the other relay-magnet (*b* or *a*), and a third branch of which is controlled by the two independent magnets jointly, and a signal-operating circuit having two branches, each branch being controlled by one of the said independent magnets jointly with the relay-magnet of the other independent magnet, substantially as described.

6. In a railway electrical signaling system the combination of two track-sections, two independent magnets, (as A or B,) one electrically connected with one and the other with the other of the track-sections, a relay-magnet, (as *a* or *b*,) for each of said independent magnets, in a compound circuit one branch of which is controlled by the relay-magnet itself (*a* or *b*) and the said independent magnet (A or B) jointly, another branch of which is controlled by the other relay-magnet (*b* or *a*), and a third branch of which is controlled by the two independent magnets jointly, substantially as described.

Signed by me, in New York, this 21st day of March, 1893.

CHARLES P. BREESE.

In presence of—

THOMAS EWING, Jr.,
SAMUEL W. BALCH.