

G. THOMPSON.  
ELECTROMAGNETIC BLOCK SYSTEM.  
APPLICATION FILED MAY 16, 1901.

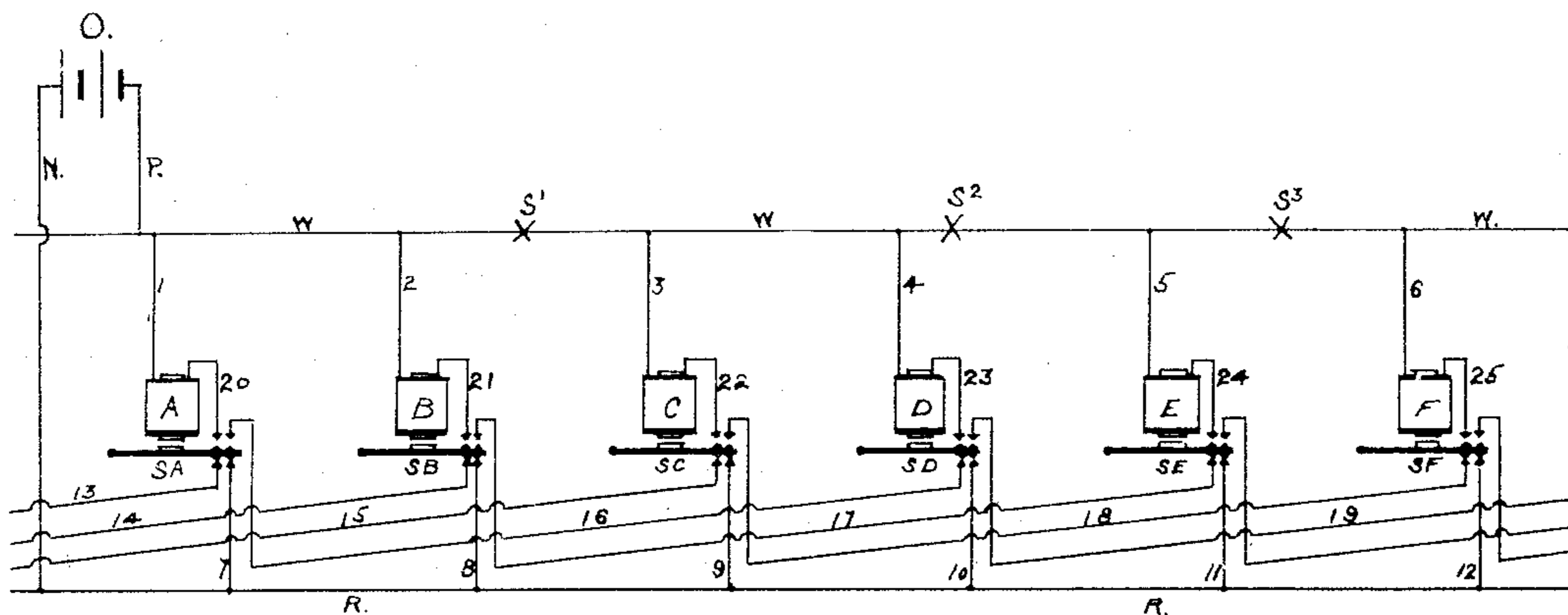


Fig 1.

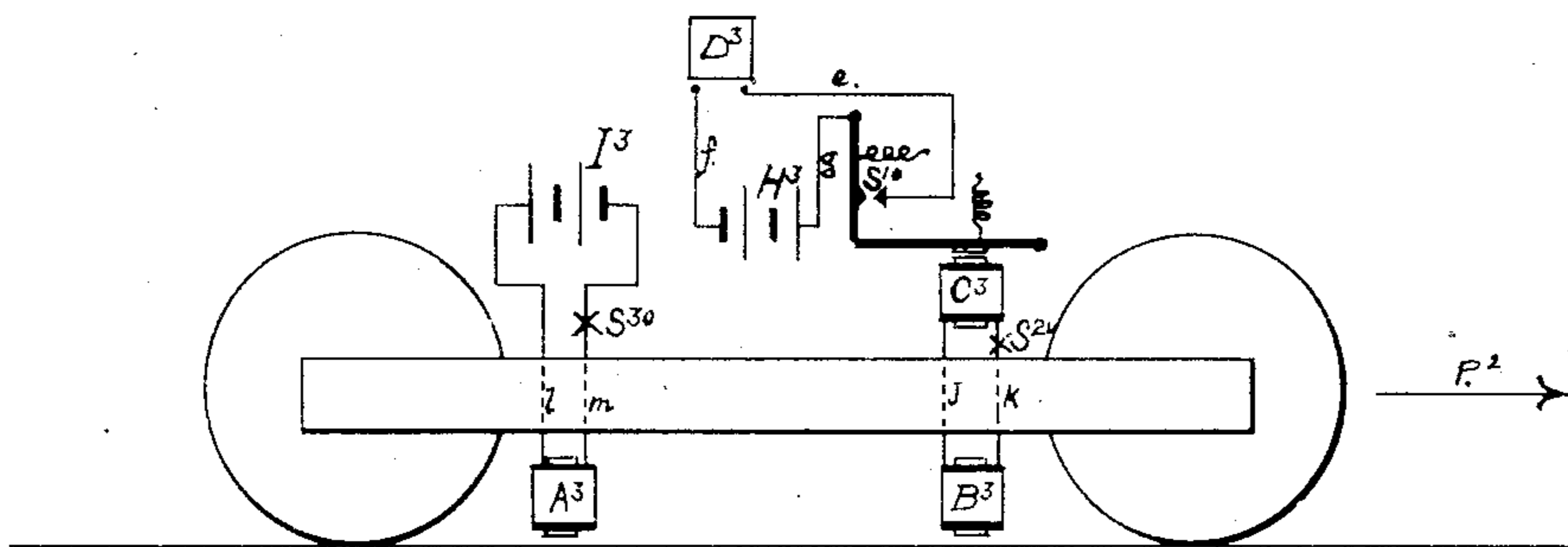


Fig 2.

Witnesses

*A. Johnson*  
*John J. Chase*

Inventor

Guion Thompson

By

*James T. Watson*  
Attorney

# UNITED STATES PATENT OFFICE.

GUION THOMPSON, OF TWO HARBORS, MINNESOTA, ASSIGNOR TO THE THOMPSON SAFETY APPLIANCE COMPANY, A CORPORATION OF NEW JERSEY.

## ELECTROMAGNETIC BLOCK SYSTEM.

SPECIFICATION forming part of Letters Patent No. 791,594, dated June 6, 1905.

Application filed May 16, 1901. Serial No. 60,428.

*To all whom it may concern:*

Be it known that I, GUION THOMPSON, a citizen of the United States, residing at Two Harbors, in the county of Lake and State of Minnesota, have invented new and useful Improvements in Electromagnetic Block Systems, of which the following is a specification.

My invention relates to electromagnetic block systems, and has for its object the provision of means for progressively creating and dissolving spheres of magnetic influence at intervals along a predetermined route, and has for its further object the provision of means whereby any desired number of such spheres of influence may be successively created and each normally continued in existence until successively dissolved by the operation of means for creating, respectively, corresponding spheres of influence farther along said route.

It consists in the combination of a normally open electric circuit including a source of electricity, the coil of an electromagnet, a normally open circuit-controlling contact and a normally closed circuit-controlling contact, governing means adapted to close said normally open contact, governing means adapted to open said normally closed contact, a core within the coil of said electromagnet adapted to be magnetized and when magnetized to control the governing means for closing said normally open contact, transient means adapted to operate said governing means for closing said normally open contact and subsequently to operate said governing means for opening said normally closed contact.

It also consists of certain other constructions, combinations, and arrangements of parts, as will be hereinafter more particularly set forth and claimed.

In the drawings, Figure 1 is a diagram showing the portions of my said invention which are located along and are relatively stationary to said route. Fig. 2 is a diagram showing the portion of my said invention which is movable with relation to said route, the same being mounted on a movable conveyance, and further showing a signal device

for the purpose of illustrating the utility of my said invention.

In the drawings, A, B, C, D, E, and F are electromagnets of any suitable construction, preferably comprising a core of soft iron and a surrounding coil of insulated wire, one end of the coil of each of which electromagnets is connected to one of the poles, as at P, of an electric battery O or other suitable source of electricity by a conductor of electricity W, common to each of said coils, and by branch conductors, as 1, 2, 3, 4, 5, and 6, respectively, connecting the coils of said magnets with said common conductor W. The opposite end of each of said coils extends, as, respectively, at 20, 21, 22, 23, 24, and 25, beyond the body of the coil and is provided with a suitable electricity-conducting terminal contact adapted in operation to bear against an electricity-conducting contact supported by a respectively contiguous armature, as SA, SB, SC, SD, SE, and SF, which latter contact may, if desired, be insulated from said armature and which armatures are pivotally or otherwise in any suitable manner secured in positions contiguous, respectively, to said magnets A, B, C, D, E, and F and have a limited movement with relation thereto and are adapted to be influenced by and by such influence to be drawn toward the cores of their corresponding magnets when said magnets are respectively energized, as hereinafter described. Said armatures are respectively provided with four intercommunicating electricity-conducting contacts carried thereby, and, if desired, insulated therefrom, or, if desired, forming a part thereof, one of which contacts is when its supporting-armature is by the magnetic influence of its contiguous energized electromagnet drawn toward said electromagnet adapted to bear against the terminal contact of the coil of said electromagnet, as, respectively, at 20, 21, 22, 23, 24, and 25, and at the same time another of said armature-supported contacts is adapted to bear against a terminal contact at the end in the vicinity of said coil, of an intermediate conductor of

electricity extending, as, respectively, at 16 17 18, from the vicinity of the free end of the coil of such electromagnet to the vicinity farther along said route of the free end of a conductor of electricity extending, as at 10, 11, 12, and R, from the opposite pole N of said source to the vicinities of said armatures, respectively, at which time the third and fourth of said armature-supported contacts do not bear against anything. When, however, said armatures are freed from magnetic influence, they recede from their respectively contiguous electromagnets, and thereupon the third of said armature-supported contacts is adapted to and does bear against a terminal contact at the end of a relatively different one of said intermediate conductors extending therefrom, as at 15, 14, and 13, respectively, backward to the vicinity of the coil of a corresponding electromagnet nearer to the starting-point of said route, and at the same time the fourth one of said armature-supported contacts is adapted to and does bear against a terminal contact upon the free end of a corresponding branch conductor of electricity, as, respectively, at 9, 8, and 7, connected, respectively, at their opposite ends to a conductor of electricity R common to all of said last-described branch conductors, one end of which conductor R is connected, as at N, to the opposite pole of said battery O and the opposite end of which conductor R is preferably provided with a contact and arranged to operate in the same manner as one of said branch conductors. A magnet of any suitable construction, but preferably an electromagnet A<sup>3</sup>, provided with a battery I<sup>3</sup> or other suitable source of electricity and intermediate electricity-conducting connections, as *l* and *m*, from the opposite poles of said battery to the opposite ends of the coil of said electromagnet, is preferably mounted upon a suitable conveyance, as shown in Fig. 2, and is adapted to pass successively over or near said electromagnets A, B, C, D, E, and F and in passing to transmit to the same magnetic energy. As shown in Fig. 1, all the electromagnets therein illustrated are inert, there being no connection or circuit established between the pole P of said battery O through any of said electromagnets to the pole N of said battery, which indicates that no conveyance bearing an energized electromagnet A<sup>3</sup> has recently passed over any of them.

The operation of my said invention is as follows: Upon said energized magnet A<sup>3</sup> passing over or near said inert electromagnet A it momentarily energizes the same, whereupon said electromagnet A exerts a magnetic influence upon its contiguous armature SA, drawing it toward itself until said first armature-supported contact bears against said coil terminal contact 20 and said second armature-supported contact bears against

the terminal contact of the contiguous end of said intermediate conductor 16, whereupon an electric circuit is established from the pole P of said battery O through conductor W, branch conductor 1, the coil of said electromagnet A, the first and second contacts upon the armature SA, the intermediate conductor 16, the third and fourth contacts upon the armature SD, the branch conductor 10, the conductor R, to the pole N of said battery O, which results in the normal maintenance of magnetic energy in the core of said magnet A and the continuance of said circuit of electricity until said moving electromagnet A<sup>3</sup> reaches the vicinity of and energizes the electromagnet D, which in thereupon attracting the armature SD breaks the said last-described circuit and the electromagnet A becomes again inert and its contiguous armature SA is released and returned by gravity or a suitable spring or otherwise to its normal position, and its third and fourth contacts are thereby brought into touch, respectively, with the terminal contacts of the conductor 13 and the branch conductor 7. It is obvious that each of said stationary electromagnets is therefore dependent for initial vitality upon said movable magnet and for continued vitality upon said source of electricity O and also upon the continuance in its respective circuit of said third and fourth contacts upon an armature contiguous to a relatively corresponding but inert stationary electromagnet farther along said route and is devitalized and its sphere of magnetic influence is dissolved simultaneously with the energizing of said relatively corresponding stationary electromagnet in manner aforesaid. As will be observed from said Fig. 1, the electromagnet A is thus dependent on electromagnet D, which in turn is dependent on electromagnet G, (not shown,) and so on, as desired. In like manner electromagnet B is dependent on electromagnet E and electromagnet C on electromagnet F, in every instance shown two said electromagnets intervening between two relatively corresponding electromagnets.

The purposes and utilities of my said invention are manifold; but one illustration will be sufficient, for the purposes of which illustration said invention may be assumed to form part of a railway signal system by which a signal may be made in the cab of a locomotive (represented by said conveyance shown in said Fig. 2) and for which purpose it may be assumed that said conveyance or locomotive is provided with a signal-bell D<sup>3</sup>, included in a normally open circuit including a source of electricity and a spring-operated circuit-closing contact, a restraining-trigger constituting an armature and adapted to normally oppose said spring-operated contact and a series of electromagnets C<sup>3</sup> and B<sup>3</sup> adapted when energized to attract said trigger and

release said spring-operated contact. It will now be apparent that if a locomotive so equipped pass over said electromagnet A and leave the same energized, as aforesaid, and stop before arriving at said electromagnet D and a second locomotive so equipped follows said first locomotive the electromagnet A during the passage of said second locomotive will induce a current of electricity in electromagnet B<sup>3</sup> which will be transmitted by the wires *j k* to the coil of the electromagnet C<sup>3</sup>, thus energizing the electromagnet C<sup>3</sup>, which will then attract said trigger-armature, and thereby release said spring-operated contact, which will close said bell-circuit at S<sup>10</sup> and cause said bell to sound, warning the engineer of the presence of said first locomotive in the interval between said electromagnet A and said electromagnet D. It is further obvious that any greater or less number of such electromagnets might be interposed in like manner between two relatively corresponding electromagnets, or that such interposing electromagnets might be entirely omitted, all within the scope of my said invention, and that any suitable source of electricity may be substituted in place of the battery O as the equivalent thereof, and that any suitable style of electromagnets or armatures or contacts or conductors may be used within the scope of my said invention, or any suitable form of conveyance used for said magnet or electromagnet A<sup>3</sup>, and that any of the elements employed in said invention may be of any suitable construction or dimensions or connected or brought into communication or supported in any suitable manner or by any suitable means, and that the contacts on said armatures may be integral with each other or separate and connected by suitable electricity-conducting means or arranged in integral or connected pairs or otherwise, as may be suitable, or may be omitted and any suitable means substituted which under the control of said armature will operate to establish equivalent electrically-communicative relations between the terminal contacts of said conductors, and that said conductors 1, 2, 3, 4, 5, and 6 may in connection with conductor W be respectively regarded as separate individual conductors, or said conductor W may be regarded as a conductor common to all the stationary electromagnets with individual branches, and that in the equipment of a long route other sources of electricity similar to O and for similar purposes may be stationed at intervals along said route and connected to said conductors R and W and for the purposes of the invention all regarded as one source of electricity, and that the system or systems thus created may be duplicated and extended upon one or more routes at will and the several systems supplied with electricity by a common source O or by individual sources of like nature, and that in other de-

tails equivalents may be adopted, if desired, instead of those described and minor alterations and modifications made in said invention and all within the scope and spirit of the same. I also preferably insert one or more suitable switches, as at S' S<sup>2</sup> S<sup>3</sup> S<sup>30</sup>, at any convenient and desirable points in the line of one or more of said conductors of electricity for the purpose of arbitrarily breaking the circuit when desired for making repairs or otherwise.

Having now described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In means for the purpose described the combination of a series of normally open electric circuits, each including a source of electricity, the coil of an electromagnet, a normally open circuit-controlling contact adapted to be closed by said magnet when said magnet is energized, and a normally closed circuit-controlling contact adapted to be opened by the electromagnet of another of said circuits when said last-named magnet is energized, substantially as described.

2. In means for the purposes described the combination of a plural number of stationary electromagnets, each provided with an armature adapted to govern circuit-controlling contacts; a source of electricity; a plural number of normally open electric circuits, each including a source of electricity, the coil of one of said electromagnets, normally open circuit-controlling contacts adapted to be closed by the operation of the armature of said magnet and also including normally closed circuit-controlling contacts adapted to be opened by the operation of the armature of another of said electromagnets, a transient magnet adapted to pass sufficiently near said stationary electromagnets successively to successively and magnetically energize the same, substantially as described.

3. The combination of an electromagnet and a distant armature, stationed along a predetermined route, a source of electricity relatively stationary to said electromagnet; electricity-conducting means connecting one of the poles of said source with one of the ends of the coil of said electromagnet; a conductor of electricity extending from the opposite pole of said source to the vicinity of said distant armature, an intermediate conductor of electricity extending from the vicinity of the free end of the coil of said electromagnet to the vicinity of the free terminal of said conductor leading to said opposite pole, means subordinate to the control of said electromagnet and adapted when said electromagnet is energized to effect a conductual communication between the free end of the coil of said electromagnet and the adjacent end of said intermediate conductor and means supported by said distant armature adapted when said armature is in its normal position

to effect a conductual communication between the adjacent free terminal of said intermediate conductor and the free terminal of said conductor leading to said opposite pole; a transient source of magnetic energy adapted first to energize said electromagnet and subsequently to operate said distant armature to break said communication between the conductor leading from said opposite pole and said intermediate conductor.

4. In means for the purposes described, the combination of two electromagnets and a distant armature stationed along a predetermined route; a source of electricity relatively stationary to said electromagnets; electricity-conducting means connecting one of the poles of said source with one of the ends of the coil of each of said electromagnets; conductors of electricity respectively extending from the opposite pole of said source to the vicinity of the second electromagnet and to the vicinity of the distant armature; an intermediate conductor of electricity extending from the vicinity of the free end of the coil of said first electromagnet to the vicinity of the free end of the conductor extending from said opposite pole to the vicinity of said second electromagnet; a second intermediate conductor of electricity extending from the vicinity of the free end of the coil of said second electromagnet to the vicinity of the free end of the conductor extending from said opposite pole to the vicinity of said distant armature; electricity-conducting means supported by said distant armature and adapted, when said armature is in normal position, to effect a conductual communication between the adjacent free end of said second intermediate conductor and the adjacent free end of said conductor to said opposite pole; means respectively adapted, when said first electromagnet is energized and when said second electromagnet is inert, to effect a relation of electrical intercommunication between the free end of the coil of said first electromagnet and the adjacent end of said first intermediate conductor and between the opposite end of said first intermediate conductor and the end adjacent thereto of said conductor extending from said opposite pole to the vicinity of said second electromagnet, and further adapted, when said second electromagnet is energized, to break the communications thus by the energizing of said first electromagnet established and, in part, to effect a relation of electrical intercommunication between the free end of the coil of said second electromagnet and the end thereunto adjacent of said second intermediate conductor.

5. In means for the purposes described, the combination of a plural number of electromagnets stationed along a predetermined route; a source of electricity relatively stationary to said electromagnets, electricity-

conducting means connecting one of the poles of said source with one of the ends of the coil of each of said electromagnets, conductors of electricity respectively connected to the opposite pole of said source and extending therefrom to the respective vicinities of each of said electromagnets; intermediate conductors of electricity extending respectively from the vicinity of the free end of the coil of each of said electromagnets to the vicinity of the free end of the conductor extending from said opposite pole to the vicinity of the relatively succeeding said electromagnet; means adapted, when any one of said electromagnets is energized, to effect a relation of electrical intercommunication between the free end of the coil of said energized electromagnet and the adjacent end of the said intermediate conductor and simultaneously to break the communication between the preceding intermediate conductor and the adjacent conductor leading to said opposite pole, whereby the energization of any of said electromagnets completes the circuit including such magnet and breaks the circuit including a preceding magnet.

6. In means for the purposes described, the combination of a plural number of electromagnets stationed along a predetermined route; armatures respectively secured in positions contiguous to said respective electromagnets and having a limited movement in relation thereto and adapted to be operated thereby; a source of electricity bearing a fixed relation to said electromagnets; electricity-conducting means connecting one of the poles of said source with one of the ends of the coil of each of said electromagnets; intermediate conductors of electricity extending respectively from the vicinity of the free end of each of said coils to the vicinity of the armature of a relatively corresponding electromagnet farther along said route; electricity-conducting means extending from the vicinity of each of said armatures to the opposite pole of said source of electricity; an electricity-conducting contact carried by each of said armatures adapted in operative position to bear against the free terminal of the coil of the contiguous electromagnet and against the terminal in the vicinity thereof of said intermediate conductor; an electricity-conducting contact carried by each of said armatures adapted when said armature is in retracted position to bear against the opposite terminal of another said intermediate conductor and against the free terminal in the vicinity thereof of the electricity-conducting means leading to the opposite pole of said source of electricity, substantially as described.

7. In means for the purposes described, the combination of electromagnets stationed along a predetermined route; armatures respectively secured in positions contiguous to

said electromagnets and having a limited movement in relation thereto and adapted to be operated thereby; a source of electricity bearing a fixed relation to said electromagnets; 5 electricity-conducting means connecting one of the poles of said source with one of the ends of the coil of each of said electromagnets; intermediate conductors of electricity extending respectively from the vicinity of 10 the free end of each of said coils to the vicinity of the armature of a relatively corresponding electromagnet farther along said route; electricity-conducting means extending from the vicinity of each of said armatures to the opposite pole of said source of 15 electricity; an electricity - conducting contact carried by each of said armatures and adapted, when said armature is attracted toward its respective magnet, to bear against 20 the free terminal of the coil of said magnet; a second electricity-conducting contact carried by each of said armatures and communicating with said first contact and adapted, when its supporting-armature is attracted 25 toward its respective magnet, to contact with one of the terminals of said intermediate con-

ductor; a third contact carried by each of said armatures and adapted, when its supporting-armature is free from magnetic influence, to contact with the opposite terminal of another of said intermediate conductors; a fourth contact carried by said armature and communicating with said third contact and adapted, when its supporting-armature is free from magnetic influence, to contact with the free terminal of said electricity-conducting means leading to the opposite pole of said source of electricity; means 35 movable with relation to said electromagnets and exerting magnetic influence and adapted to pass sufficiently near said stationary electromagnets to momentarily energize the same, respectively and successively, substantially as described. 40

In testimony whereof I have signed my 45 name to this specification in the presence of two subscribing witnesses.

GUION THOMPSON.

Witnesses:

JAMES T. WATSON,  
PHINEAS AYER.