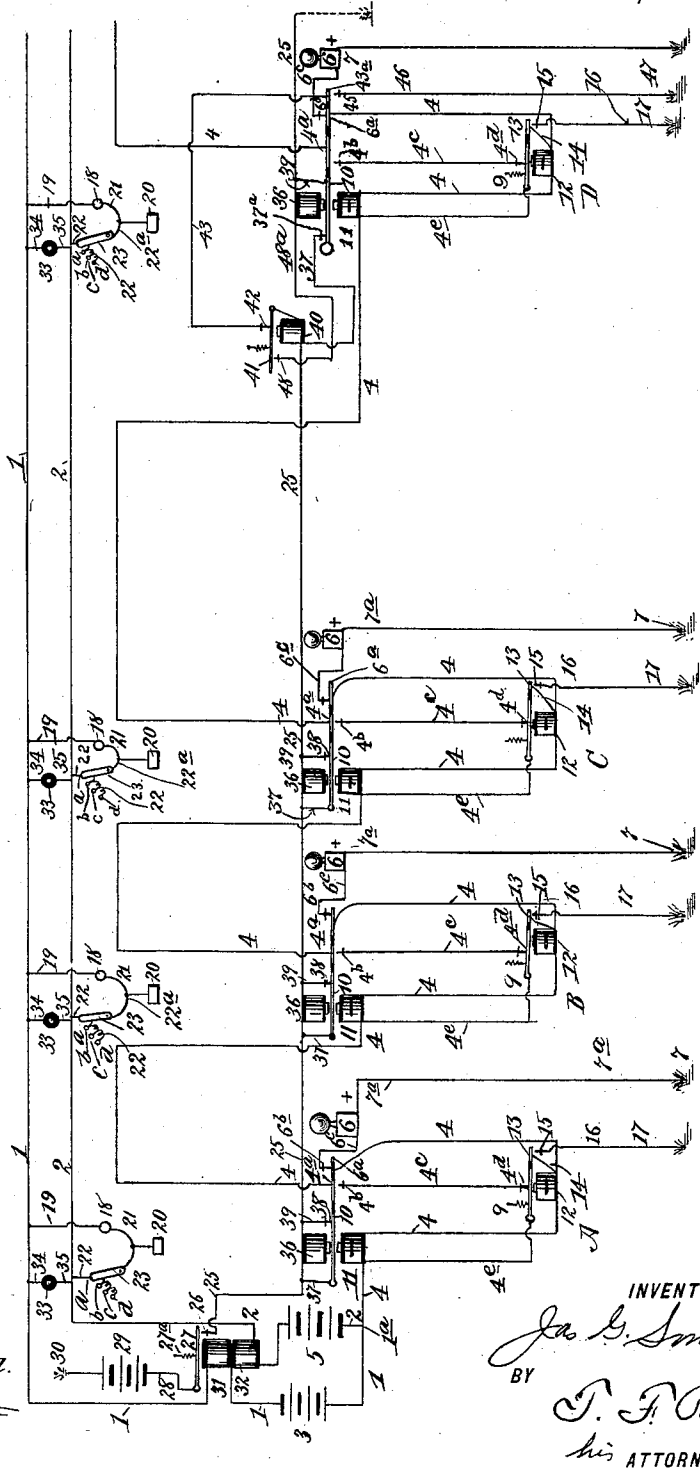
(No Model.)

J. G. SMITH.

ELECTRIC SIGNALING OR CALLING SYSTEM.

No. 593,820. Patented Nov. 16, 1897.



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ELECTRIC SIGNALING OR CALLING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 593,820, dated November 16, 1897.

Original application filed April 4, 1895, Serial No. 544,401. Divided and this application filed July 14, 1897. Serial No. 644,490. (No model.)

To all whom it may concern:

Be it known that I, JAMES G. SMITH, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Electrical Signaling or Calling Systems, of which the following is a specification.

This application is a division of an application for patent on improvements in electrical succession signaling or calling systems filed by me on April 4, 1895, Serial No. 544,401; and this invention relates to that class of signaling or calling systems in which several stations are located on a circuit and wherein any station or subscriber can call or signal to any other desired station without calling the intervening station or stations.

In carrying out my invention I provide a series of stations on a circuit, and in each station is a signaling instrument connected with a wire normally leading to ground or to a return-wire. A wire normally leads from one station to the call-bell at the next station, and in the first-mentioned station the circuit is normally broken or does not lead directly back to the preceding station. In each station are novel means for completing the line from a station on one side of it to a station on the opposite side of it, so as to establish a line from one station through an intermediate station to another station, the said devices in an intermediate station being operated by a subscriber in a calling-station when he desires to communicate with a station to be called. In thus establishing the circuit in said intermediate station to enable a calling-station to communicate with a called station the bell at the intermediate station is cut from the line, so that it will not be operated by the calling subscriber.

The invention also consists in the novel details of improvement that will be more fully hereinafter set forth, and then pointed out in the claims.

Reference is to be had to the accompanying drawing, forming part hereof, which is a diagrammatic view of a calling or signaling system embodying my improvements.

In the accompanying drawing the letters A B C D indicate a series of stations, at each of which the appropriate devices hereinafter set forth are located.

The numeral 1 indicates a line-wire which passes through all the stations and serves, as hereinafter shown, as part of the circuit for the call-bells or signaling instruments for stations on a circuit.

2 is a line-wire also passing through all the stations, like wire 1, and it serves as part of a circuit to establish electrical connection between any two stations for the bell at a called station, while cutting out the bell or bells at an intermediate station or stations. The wire 1 includes a battery 3, and in the example illustrated enters the battery at the negative pole and passes out from the positive pole thereof and is connected to a wire 4. The wire 2 likewise includes a battery 5 and, as shown, enters the battery at the positive pole and passes from the negative pole to the wire 4, the wires 1 and 2 being connected with wire 4 at 1^a. Thus when the circuit through wire 1 is closed a positive current is discharged through wire 4, and when the circuit through wire 2 is closed a negative current is sent over the line 4 for a purpose set forth hereinafter.

The wire 4 forms part of a normal sectional circuit through the several stations for the purpose of connecting the stations together, as desired, and for operating the call-bell at the desired station. The batteries 3 5 are shown located at station A, the first station on the circuit. The wire 4 at each station leads through suitable make-and-break contacts directly to a call-bell or signaling device 6, the magnet of which is shown leading to ground 7 by wire 7^a, which I prefer to using a return-wire, but of course the latter could be provided instead of the ground. The magnets of the call-bells are polarized as for a positive current, so that the discharge from battery 3 when the circuit-wire 1 is closed will operate the desired bell. As stated, the wire 4 at station A, or the first station on the circuit, leads from wire 1 to the corresponding bell 6, but does not lead directly to the bells of the other stations on the circuit. From each station, as A B C D, a wire 4 leads from a contact 4^a to the bell at

the next following station, as from A to B and from B to C, &c. The contact 4^a is adapted to make electrical engagement with a contact 4^b on a wire 4^e, that leads to a contact 4^d. The contact 4^d is adapted to engage an armature or contact 9, that is connected by a wire 4^e with the wire 4, as shown. The parts above described are correspondingly arranged at each station. Thus when contacts 4^a and 4^b are in engagement, as well as the contacts 4^d and 9, at a station, as A, the bell-circuit will be established from A to B directly to the ground 7, through the bell 6 at B, as follows: from 4 (at A) to 4^e, 9, 4^d, 4^c, 4^b, 4^a, and 4 (from A to B) to bell 6 and ground 7 at B.

The contact 4^a is carried by an armature 10, from which it is insulated, and said armature also carries a contact 6^a, which is insulated from the contact 4^a and is connected with the wire 4 in its station. The contact 6^a is adapted to make and break engagement with a contact 6^b, which leads by a wire 6^c to the magnet of the bell 6. In the normal positions of the armatures 10 the contacts 6^a and 6^b in each station are in engagement to establish a normal circuit from the wire 4 through the bell-magnet to ground, while at the same time the contacts 4^a and 4^b are out of engagement, so as to normally break the line from one station to another. When the armature 10 is first operated in any station, it will break the circuit through its bell at 6^a 6^b and establish the circuit at 4^a 4^b directly to the bell at the next station from 4 4^e through 9, 4^d, 4^c, 4^b, and 4^a to 4 in the station that is operated, and so on through the stations as armatures 10 are successively operated until the desired station is reached without operating the devices at a station beyond the called station. Thus it will be seen that the circuit described is what I call "sectional," because it is normally broken from station to station and yet adapted to be established from station to station successively.

In each station a magnet 11 is located on the wire 4, and said magnet is adapted to attract armature 10 to break the line for the bell at 6^a 6^b and to connect two sections of the line 4 together at 4^a 4^b, to establish a line through one station to the bell and ground at the next station, and so on through the several stations, as the case may require. The wire 4^e leads from armature or contact 9 to wire 4, outside of magnet 11, so that the current when passing through one station to another (after the connections at 4^a, 4^b, 9, and 4^d have been established) need not traverse magnet 11, said magnet thereby being cut out from the circuit so established. The magnet 11 is polarized, as for a negative current, so as to be operated from batttry 5. Thus when a negative current is discharged from battery 5 the magnet 11 will operate without affecting a call-bell, and when a positive current is discharged from battery 3 the call-bell in circuit with line 4 will operate and the magnet 11 will not be affected. The armatures 10 are "dead" armatures, or so arranged as to remain in any position to which they may be set, and they are returned to their normal positions, as hereinafter explained.

12 are magnets in each station located on the wire 4, leading into its station and polarized similarly to magnets 11, so as to operate at the same time therewith. The magnets 12 are arranged to attract the respective armatures or contacts 9 to temporarily break the circuit 4^e 4^e at 4^d at the time that the corresponding armature 10 moves to break the bell-circuit at 6^b and establish a through circuit at 4^a 4^b to the next station. The armature 9 also carries a contact 13, which is insulated therefrom and leads by a spur-wire 14 to one terminal of magnet 12. Contact 13, when armature 9 is attracted by magnet 12, is adapted to engage a contact 15, that leads by a wire 16 to ground, as 17. By this means when magnet 12 at any station is energized and the ground 7 for wire 4 is broken through the simultaneous action of magnet 11 and armature 10 at 6^a 6^b a new ground is established to 17 at 13 15, so as to prevent armature 9 from returning before battery 5 is broken from the line by the calling operator, thereby preventing current from passing by way of 4^e, 9, 4^d, 4^c, 4^b, and wire 4 to magnets 11 and 12 at the next station prematurely.

With the arrangement above described if a party at one station desires to call another station he sends a negative impulse from battery 5 through line 4, which energizes magnets 11 and 12 in the intervening station, which magnet 11 attracts its armature 10 to cause the latter to break the bell-circuit at that (the intervening) station and to establish connection with wire 4 at 4^a 45 to the next station. Armature 9, when attracted by magnet 12, as stated, establishes the new ground 17 at 13 15 to keep the circuit temporarily broken at 9 4^d. The negative current being next broken from the line, as by removing the finger from a push-button or operating a switch, allows the armature 9 to move back, which armature establishes the complete circuit at 9 4^d and breaks the ground-circuit 17 at 13 15, thus cutting out magnet 12. The bell-circuit from one station to the next is thus established at station A from the junction 1^a of wires 1 and 2 with wire 4 to 4^e through 9, 4^d, 4^c, 4^b, 4^a, and 4, leading to the next station, as B, the circuit being thus completed to the bell at B without operating stations beyond. A second negative impulse sent over the line will operate the armatures 9 and 10 in the next station B to make connection with the station beyond, C, and so on, a negative impulse being sent for each station between a calling and a called station until the desired station is reached. A positive current now being sent from battery 3 through the line so completed from station to station will energize the positive magnet in the instrument 6 at the station to be called and thus give the

desired signal. The through-line thus established from one station to another can be restored to the normal sectional condition, as set forth hereinafter.

In order to send the proper pulsation through the line to make connection at 4^a 4^b from one station to another, as well as to operate the signal device 6 at the desired station, suitable push-buttons or switches can be connected with the lines 1 and 2. I have shown a suitable arrangement for the purpose, as follows: At each station is a push-button 18, that is connected with the line 1, as by a wire 19, and with ground 20, as by wire 21, (or the buttons 18 could be included in a return metallic circuit.) The wire 2 is also connected by a wire 22 with a contact, as *a*, which leads to ground, as 20, or to said return metallic circuit. While this contact *a* may be a push-button to be operated once for each station to be passed in reaching a desired station, I preferably provide a series of such contacts *a b c d*, one for each station on the circuit, said contacts being all connected together, as by wire 22, which leads to wire 2. The contacts *a b c d*, &c., will be engaged by an arm 23, which is connected with ground, as 20, by wire 22^a, so that as arm 23 is turned, making contact with *a b c d*, a suitable number of impulses will be sent over the line from battery 5, but of course any suitable arrangement for this purpose can be provided.

Means for restoring the bell-circuits 4, &c., to their normal sectional conditions are provided as follows: 25 is a line-wire passing through the stations, as shown, and preferably grounded at the end of the line farthest from A, (the first station,) the circuit through line 25 being normally broken at station A. For this purpose the wire 25 is shown at A provided with a contact 26, adapted to be engaged by a spring-acting armature 27, which leads by a wire 28 through a battery 29 to ground 30, whereby when the armature 27 engages contact 26 wire 25 will be supplied with current to energize magnets 36 on said wire, which thereupon attract their respective armatures 10 to restore the circuit in the several stations, as hereinafter shown.

For convenience in operating my system with as few wires as possible I have provided a double magnet 31 32 for armature 27, which must be energized by batteries 3 and 5 together in order to attract armature 27, the spring 27^a for said armature being of sufficient strength to resist the action of one battery 3 or 5. The coil 31 is connected with wire 1 and battery 3, while coil 32 is connected with wire 2 and battery 5, the wires 1 and 2 being also connected together at station A at 1^a.

33 is a push-button connected by wires 34 35 with the wires 1 and 2, respectively, so that when the circuit is closed in push-button 33 a local circuit is established through the double magnet to include batteries 3 and 5. The circuit through wires 1 and 2 is completed as follows: from 33 (in any station) through 34 to 1, thence through coil 31 to battery 3, thence through 1^a, 2, and battery 5 to coil 32 to 2 and 35 to 33. Both batteries 3 and 5 now act on the coils of the double magnet 31 32 with sufficient force to attract armature 27 and establish the circuit through wire 25 from ground 30. The contact at 33 is preferably made of long duration to insure the closing of wire 25 for a sufficient length of time for the purpose desired; but the means shown in my application, Serial No. 544,401, Fig. 1, above mentioned for operating the circuit-changing devices on wires 4, as well as the call-bells, and for closing the circuit through wires 1 and 2 to operate magnet 31 32 may be used, if preferred.

The wire 25 at each station on the circuit includes a magnet 36, as stated, which is adapted to attract the corresponding armature 10 to break the completed circuit 4 at 4^a 4^b and reëstablish the circuit for the corresponding bell 6 at 6^a 6^b. Shunts are provided around the magnets 36, which shunts are closed when the armatures 10 are in their normal positions. For this purpose said armatures are shown connected by wires 37 with the wire 25, and said armatures are adapted to normally engage contacts 38, that lead by wires 39 to wire 25, the parts 37, 10, 38, and 39 forming the shunts around magnets 36. When magnet 11 attracts its armature 10, the shunt around the corresponding magnet 36 will be broken, so that when the circuit in wire 25 is closed at 26 27 the magnet 36, whose shunt is broken, will be energized to attract its armature 10 to restore the latter to its normal position. The shunts around magnets 36 serve to reduce the size or amount of battery 29 that would be necessary were the circuit 25 directly and permanently maintained through all the magnets 36.

To further reduce the requirements of the battery 29, I preferably arrange the line 25 to be divided or broken into sections, these sections including a number of stations in a series—say three, five, or ten. In the example shown there are three stations in a series, A B C, included in a section of wire 25, which is for simplicity of illustration. The sections of wire 25 are normally connected together and are broken or separated and a ground provided for a section when a station beyond any series of stations is operated. For this purpose the wire 25 at a point between the last station of one series, C, and the first station of the next series, D, is provided with a magnet 40, whose spring-actuated armature 41 normally engages a contact 42 on a wire 43, which leads to contact 43^a on the armature 10 and insulated therefrom. In the example shown the contact 43^a (when armature 10 in the first station of the next series of stations, as D, is operated by the magnet 11 at that station) is adapted to engage a contact 45, which leads by wire 46 to ground at 47 to es-

tablish a ground for the corresponding section of line-wire 25, and at this point the wire 37 is not permanently connected with armature 10, but has a contact 37^a to engage and disengage said armature, the circuit thus leading, through 37, 37^a, 10, and 39, to 25, thus normally shunting magnet 40 from the line. When the parts are all in their normal positions and the circuit through wire 25 is closed at 26 27, the circuit will be directly through wire 25, shunting magnet 40; but if armature 10 at the first station of a second series, as D, has been operated in reaching a station beyond it the circuit through 37 will be broken at 37^a and the wire 25 will find ground at 47, through 40, 41, 42, 43, 43^a, 45, and 46, for the first series of stations, whereby all magnets 36 on said section of wire 25, that is grounded, as stated, will attract their respective armatures 10 to cause the latter to break the line 4 into its normal sectional condition and restore the ground-circuits for the bells and also restore the shunts around said magnets. At the same time magnet 40 will be energized and attract its armature 41 to break ground 47 at 42. Armature 41, which is normally connected with wire 25, is thus brought into engagement with a contact 48, connected by a wire 48^a with the next section of wire 25, leading through the magnet 36 at D and through wire 25 for the second series of stations, &c., the line 25 being thus reëstablished to the second series of stations. If armature 10 in the first section of the third series of stations on wire 25 has been operated, the same action will take place there to restore all armatures 10 in the second series of stations, and so on through all the series of stations on wire 25, as the case may be, operating only a few magnets 36 at a time. Thus all the magnets 36 in a series of stations on a section of wire 25 are shunted from the line as the series of stations are passed, so that the current will not have to traverse them to reach a station or stations beyond, the magnet 40 being also shunted when the armature 10 in the second series of stations is attracted by its magnet 36, and so on through the stations on a series, as the case may be.

It will be understood from the foregoing description that the call-bell and circuit-changing devices in each station are normally wholly separated from the next, but that each station can be connected with the next, the devices operating one at a time and successively to break the call-bell circuit and establish a through-line at each station operated, and that one station is reached without operating the circuit-changing devices in any station beyond.

My improvements may be used with suitably-arranged telephone instruments—for instance, as shown in my said application, Serial No. 544,401.

Having now described my invention, what I claim is—

1. In a signaling or calling system a plurality of stations, a circuit for said stations divided into sections in said stations, two magnets on said circuit in said stations, an armature for each of said magnets, one of said armatures being arranged to break the circuit of the signaling instrument in its station and to connect two sections of said circuit to partially establish a complete circuit through said station, the other of said armatures being arranged to temporarily break said circuit and to then complete the circuit, substantially as set forth.

2. In a signaling or calling system, a plurality of stations, a signaling instrument in each station, a circuit leading from one station to the signaling instrument in the next station and normally broken in the first-mentioned station, two magnets in each station located on said circuit, an armature for each of said magnets, one of said armatures being arranged to break the circuit through its signaling instrument and to form circuit with a wire that leads to the other armature, the latter armature being normally in circuit with said wire and arranged to temporarily break the circuit through said wire when its magnet is energized and to restore said circuit when the magnet is deënergized, substantially as set forth.

3. A signaling system comprising a plurality of stations, a signaling instrument in each station, a circuit leading from one station to the signaling instrument in the next station, and normally broken in the first-mentioned station, two magnets in each station located on said circuit, an armature for each of said magnets, one of said armatures being arranged to break the circuit through its signaling instrument and to form a circuit with a wire that leads to the other armature, the latter armature being normally in circuit with said wire, and arranged to temporarily break the circuit through said wire when its magnet is energized and to restore said circuit when the magnet is deënergized, and means to form a temporary ground for said circuit when the second-mentioned armature is attracted to prevent current from passing along the line until the proper time, substantially as set forth.

4. A signaling system comprising a plurality of stations, a signaling instrument in each station, a wire leading from a contact in one station to the signaling instrument in the next station, and so on through the series of stations, an armature in each station to operate the corresponding contact to join two sections of said circuit together and to break the circuit of the corresponding signaling instrument, a magnet on said circuit for said armature, a wire 4^c having a contact to engage the first-mentioned contact, a movable contact normally in circuit with the wire 4^c, a magnet on said first-mentioned circuit to operate said contact, a wire leading from said contact to the first-mentioned circuit in advance of the

first-mentioned magnet, and means to establish a new ground for the second-mentioned magnet as and for the purposes specified.

5. A signaling system comprising a plurality of stations, a signaling instrument in each station, a circuit for said signaling instrument divided into sections in each station, the magnets in said signaling instruments being polarized, two magnets 11 and 12 in each station located in said circuit, said magnets being polarized oppositely to the first-mentioned magnets, the magnets 11 and 12 having armatures arranged to make and break the sections of the first-mentioned circuit and means for discharging currents of opposite polarity through said circuit, as desired, to join sections of said circuit into a through circuit, and to operate the desired signaling instrument, substantially as set forth.

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