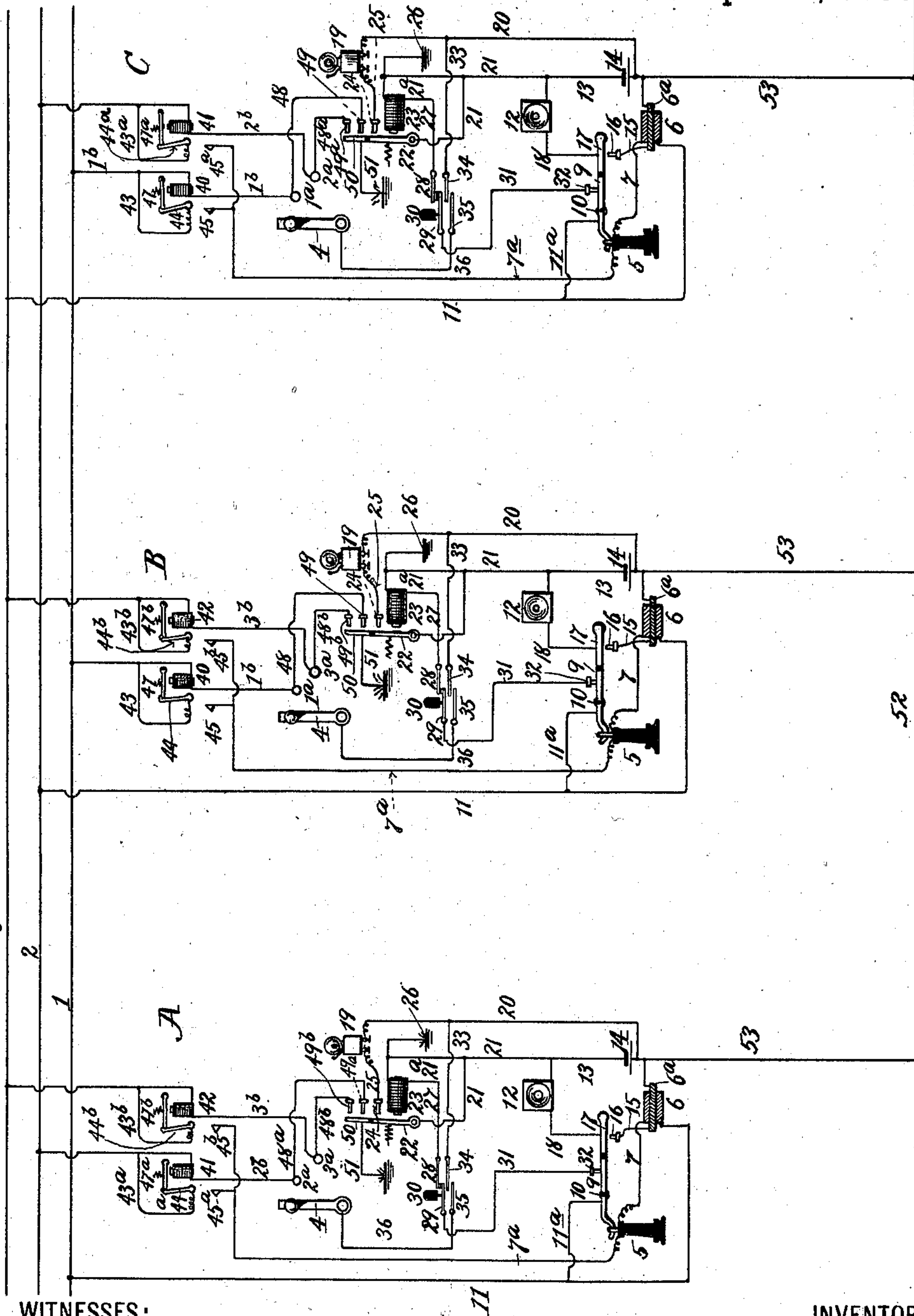


(No Model.)

J. G. SMITH.
TELEPHONE AND CALLING SYSTEM.

No. 559,088.

Patented Apr. 28, 1896.



WITNESSES:

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TELEPHONE AND CALLING SYSTEM.

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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 Telephone and Calling Systems, of which the following is a specification.

My invention relates to that class of telephone and calling systems which comprise a plurality of stations, telephone instruments in said stations, a plurality of wires passing through said stations, each wire being normally apportioned to one station, means for sending a call from one station to another, indicators or annunciators in each station connected with the line-wires normally belonging to the other stations to indicate in a called station which station has sent a call, and means in each station for connecting together the two main-line wires belonging to a calling and a called station, to form a closed metallic circuit through the telephone instruments in said two stations. In this class of systems, as known to me, the called subscriber operates switches to connect his telephone instruments with the main-line wire, that is indicated by the annunciator to form a closed metallic circuit through his telephone instruments over the line-wires normally belonging to the calling and the called stations.

The object of my invention is to so improve the above-mentioned systems as to cause the telephone instruments in a called station to be automatically connected with the main-line wire belonging to the calling station upon the operation by the calling subscriber of circuit-closing devices in the called station.

A further object of the invention is to cause a closed metallic circuit to be automatically formed through the telephone instruments in a called station over the wires normally belonging to the calling and the called stations, whereby the called subscriber is relieved from the necessity of operating switches to effect the objects above mentioned.

The invention consists in a telephone and calling system comprising a plurality of stations, a plurality of wires passing through said stations, each wire being normally apportioned to one station, calling or signaling instruments in each station arranged to be

operated by means of a current sent from a calling station over the main wire belonging to a station to be called to give a call in the latter station, telephone instruments in each station, circuit-closers in each station connected with the main-line wires normally apportioned to the other stations, a wire in each station connected with its telephone instruments adapted to be connected with the main-line wire belonging to another station upon the operation of the corresponding circuit-closer, and means in each station for operating the circuit-closer in another station to connect the main-line wires of a calling and a called station through the telephone instruments in a called station.

The invention further 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 telephone and calling system embodying my improvements.

In the drawing, the numerals 1 2 3 indicate main-line wires which pass through all the stations A B C, one of such wires being normally apportioned to each station, there being any desired or appropriate number of such stations and wires on a system, said wires being open at the ends. In each station a contact 1^a 2^a 3^a is respectively connected with the line-wires 1 2 3 belonging to the other stations, there being no such contact in a station connected with its main-line wire. I have shown spurs or branch wires 1^b 2^b 3^b connecting said main wires with said contacts, respectively.

4 are switches in each station suitably carried and arranged to make electrical connection with either contact 1^a, 2^a, or 3^a, as the case may be. In each station a wire 11 leads from the corresponding main-line wire 1 2 3, that is normally apportioned to the station, and said wire 11 leads to the secondary coil of an induction-coil 6, and then by wire 7 to a receiver 5. From receiver 5 a wire 7^a leads to contacts 45, 45^a, or 45^b, for the purpose hereinafter explained.

9 is a hook, switch, or lever, which is suitably pivoted, as at 10, and adapted to support the receiver 5, as shown. The switch 9 is

heavier at one end than the other, so that when the receiver 5 is removed from it it will descend.

From the above it will be seen that the main-line wire 1, 2, or 3 is connected through the corresponding receiver 5 in its station with the contacts 45, 45^a, or 45^b, as the case may be, as shown.

The local circuit for each transmitter 12 may be as follows: From the transmitter a conductor 13 passes to the primary coil 6^a of the induction-coil and includes a battery 14. From the coil 6^a a wire 15 passes to a contact 16. 17 is a contact carried by and insulated from the switch 9, normally out of engagement with contact 16 and adapted to engage therewith when the receiver 5 is removed from the switch. The contact 17 is connected by a wire 18 with the transmitter 12. When the receiver is removed from the switch 9, the local circuit passes from the transmitter 12 through wire 13, battery 14, coil 6^a, wire 15, contacts 16 17, and wire 18 back to the transmitter.

Means for giving a signal or call from one station to another are shown as follows: 19 is a signaling instrument or call-bell connected with a normally open local circuit which for convenience utilizes the battery 14, and for this purpose a wire 20 extends from one side of the magnet of the call-bell to the battery 14. 21 is a wire shown extending from the wire 13 (or it may be from the battery direct) to an armature 22 of a magnet 23. The armature 22 is adapted to engage a contact 24, connected by a wire 25 with the other side of the magnet of the call-bell 19. This local circuit when closed leads from 24 through 25, 19, 14, 13, 21, and 22 back to 24. It is evident that instead of using the armature 22 as part of the circuit a contact could be carried or operated thereby for the purpose. The magnet 23 in each station is located on a wire 27 leading to ground, (as 26,) and this wire 27 is normally connected with the main-line wire of its station as follows: The wire 27 passes to a contact 28, which is normally in engagement with a spring-contact 29, which may be the movable contact of a push-button or circuit-closer 30. The contact 29 leads, by a wire 31, to a contact 32, normally in engagement with the switch 9 when the receiver 5 is supported thereby, as shown, and a wire 11^a connects the switch 9 with the wire 11, which serves to connect the wire 31, through the switch 9, to the main-line wire of its station.

For convenience in utilizing the battery 14 in one station to send an impulse to the magnet 23 in another station I provide the following arrangement: From ground (as 26) a wire 21^a leads to the wire 21, and from the wire 20 a wire 33 leads to a contact 34, adapted to be engaged and moved by contact 29. 35 is a contact adapted to be engaged by contact 34 (when the latter is moved by contact 29) and the contact 35 is connected by a wire 36 with

switch 4. When the push-button 30 is operated in one station, it will break the connection at 28 29 for the magnet 23 (in that station) and establish the circuit at 34 35 from its battery to the magnet 23 at the desired station. Thus to send a call from one station to another the switch 4 is turned to the contact 1^a, 2^a, or 3^a, connected with the main-line wire of the station desired, and the push-button in the calling station is pressed.

Suppose station A is to call station C. The switch 4 at A is first turned to contact 3^a and the push-button or circuit-closer 30 at A operated. The circuit will then be from 26 through wires 21^a 21 13, battery 14, wires 20 33, contacts 34 35, wire 36, switch 4, contact 3^a, and wire 3^b, to wire 3, (all at station A,) thence along wire 3 to wire 11, (in station C,) thence through wire 11^a, switch 9, contact 32, wire 31, contacts 29 28, wire 27, and magnet 23 to ground, (at C.) The current from battery 14 (at A) now energizes magnet 23, (at C,) which, by attracting the armature 22, closes the local circuit for the bell, (at C,) whereupon a signal will be given by said bell at the desired station.

To enable a subscriber at a calling station to connect the telephone instruments in the called station with the main-line wire normally apportioned to the calling station, and at the same time establish a closed metallic circuit through the telephone instruments in the called station over the main-line wires that are normally apportioned to the two operating-stations, and at the same time, when desired, to indicate at the called station the number of the calling station, I provide the following arrangements, and in doing so I utilize the main-line wire normally belonging or apportioned to the calling station to operate the devices in the called station for making the connection above mentioned. At each station the main-line wires belonging to the other stations are connected with suitable circuit-closing devices, which are adapted to connect said main-line wires with the wire 7^a in each station that leads to the corresponding telephone instruments. For this purpose magnets 40, 41, and 42 are connected with the corresponding spur-wire 1^b 2^b 3^b of the main-line wires 1 2 3, respectively, and from said spur-wires 1^b 2^b 3^b extend branch wires 43, 43^a, and 43^b, which lead to pivoted or movable contacts 44, 44^a, and 44^b. These contacts 44 44^a 44^b are adapted, when released by the magnets 40, 41, and 42, to drop and engage the contacts 45, 45^a, and 45^b. The contacts 44, 44^a, and 44^b are held in their normal position out of engagement with the corresponding contact 45 45^a 45^b by means of armatures 47 47^a 47^b, which are adapted to be actuated by the corresponding magnet 40, 41, and 42, to release the corresponding contacts 44, 44^a, and 44^b, to enable them to engage the contacts 45, 45^a, and 45^b, respectively. These magnets and armatures may be generally in the form of an indicator having a drop car-

rying a suitable number or signification to indicate the calling station, the contacts 44, 44^a, and 44^b in this respect being substantially similar to the drop of an annunciator, with the additional feature that they serve, when operated, to complete the circuit between the wires 1, 2, or 3, and the corresponding wire 7^a in a station.

From the spur-wires 1^b 2^b 3^b extend branch wires 48 48^a 48^b, which lead, respectively, to contacts 49, 49^a, and 49^b. The contacts 49, 49^a, and 49^b are adapted to be engaged by a contact 50, carried by and insulated from the armatures 22, respectively, in the stations. The contact 50 in each station is connected with a wire 51, which leads to ground. With this arrangement when an armature 22 is attracted by a magnet 23 in a station (as when a call is given in a station) the circuit for the magnet 40, 41, or 42 will be partially established through the wires 1^b 2^b 3^b 48 48^a 48^b and contacts 49, 49^a, and 49^b, respectively, and thence through the corresponding contact 50 and wire 51 to the ground.

Any suitable means may be provided in each station to send an impulse to another station over the wire belonging to the calling station to energize the magnet 40, 41, or 42 in the called station corresponding to the calling station. For convenience in simplifying the arrangements of circuits, contacts, and push-buttons, and to reduce the number of batteries to be used on the system, I utilize some of the circuits, as well as the batteries, before described. For this purpose the contacts 29 and 34 are used to close the circuit in a station through the battery 14 in that station to and through the main-line wire of that station to the corresponding magnets 40, 41, and 42 in a called station. This circuit, to operate the magnets 40, 41, and 42, may be organized and traced as follows: From ground in the calling station (say A) to wires 21^a and 21, battery 14, wires 20 and 33 to contact 34, thence to contact 29, (when a push-button 30 is pressed,) thence by wire 31 and contact 32 to switch 9, thence by wire 11^a and 11 to wire 1 in the calling station A, thence along wire 1 to the called station, (say C,) thence by wire 1^b in the latter station, through magnet 40, thence through wire 48 to contact 49, thence by contact 50 (when armature 22 has been attracted by magnet 23 in giving a call) and by wire 51 to ground in the called station. This circuit thus closed causes magnet 40 to attract armature 47, thereby allowing contact 44 to drop to make engagement with contact 45 in the called station, thereby connecting the main-line wire of the calling station with the main-line wire belonging to the called station.

It will be apparent from what has been explained that the giving of a call and the operating of a contact 44, 44^a, or 44^b in a called station will be practically together and accomplished by the operation of a single push-button or circuit-closer, for when the push-

button 30 is operated the circuit through 33 34 35 36, &c., will be closed to give a call, whereupon and directly thereafter the circuit through 33 34 29 31, &c., is closed to operate magnet 40, 41, or 42, (to connect the main-line wires of a calling and a called station through the telephone instruments in a called station,) the current from battery 14 thereupon dividing at 34 29 35 and passing through the two branches described to ground at the called station.

It is obvious that two separate push-buttons and proper connections therefor can be used with separate batteries to operate the calling-line and the circuit-closers or annunciators over their line.

In the foregoing description only one battery 14 has been described as being used at one time, but if desired several or all of the batteries can be thrown on the line at once to increase the strength of the current being used. For this purpose I may utilize an extra open wire 52, passing through the stations and connected with the respective batteries 14 by wires 53, as shown, so that when the circuit is closed through any one battery it will draw on all the others.

The complete operation of the entire system may be explained as follows: Suppose a party at station A desires to communicate with a party at station C. He first turns the switch 4 (at A) to the contact 3^a and then operates the push-button 30, whereupon contact 29 engages contact 35, at the same time breaking the circuit at 28 29. The circuit through the magnet 23 at station C will be complete from ground 26 (at A) through magnet 42 (at A) and over the main line 3 to ground 26 (at C) and thus through its magnet 23, as before explained. Magnet 42 (at A) now releases contact 44^b, which thereby connects the wire 1 and the telephone instruments at A with the wire 3. Magnet 23 (at C) now attracts its armature 22, which closes the local circuit at 24 for the signaling instrument 19, (whereupon the latter circuit will operate to give a call,) and the armature 22 also closes the circuits for the circuit-closers 44 44^a, &c., at 49 49^a 50. The current from the battery 14 will thereupon divide and pass through the corresponding magnet, through the main-line wire 1 from station A to wire 1^b at station C, through magnet 40, thence through wire 48, contacts 49 50, and wire 51 to ground, (at C.) Magnet 40 thereupon attracts its armature and releases contact or drop 44, which then makes engagement with contact 45, the circuit thus being established from wire 1, at station C, through wire 1^b 43 44 45 and wire 7^a, and thus to the receiver 5 at the called station, and thence by wire 11 to main wire 3, thence back to station A, through wire 43^b, contacts 44^a 45^b, wire 7^a, receiver 5, wire 7, coil 6, and wire 11 to wire 1, thereby forming a closed metallic circuit through the telephone instruments in the two stations. When they have finished talking, the attendants

hang their receivers 5 upon their switches 9 and replace the previously-operated drops 44 and 44^b to their normal position. The switch 4 can be left in any position. It is obvious that when two main-line wires are being used any other line-wires can be utilized without interfering with the first-mentioned wires. It is evident also that the call-bell 19 can be located on the wire which leads from magnet 23 to ground.

From what has been described it will be seen that the calling subscriber operates a call in the called station over the main-line wire normally apportioned to the called station, and also that the calling subscriber operates devices in the called station over the main-line wire normally belonging to the calling station to connect said two wires together in the called station, so that the attendant in the called station, when he hears the call, merely has to raise his receiver from its switch, when he will find that he is in direct connection with the calling subscriber, and by looking at the contact 44, when it is arranged as an annunciator-drop, he can readily see the number of the calling subscriber. It will furthermore be seen that a calling subscriber merely has to turn his switch to the contact corresponding to the desired station and to then press his button 30 to automatically establish a complete metallic circuit through the telephone instruments in two stations over the main-line wires normally apportioned to said two stations.

It will be obvious that the particular arrangement of contacts, wires, batteries, &c., shown can be varied, while still producing the effects described, without departing from the spirit of my invention.

Having now described my invention, what I claim is—

1. In a telephone system having a plurality of stations, a plurality of wires passing through said stations, each wire being normally apportioned to one station, telephone instruments and calling devices in each station, and electrically-operating devices in each station, adapted to be operated from any other station on the system and arranged to connect the main-line wires normally belonging to two stations through the telephone instruments in a called station.

2. In a telephone system having a plurality of stations, a plurality of wires passing through said stations, each wire being normally apportioned to one station, telephone instruments in each station, calling devices in each station, means in one station for giving a call in another station over the wire belonging to the latter station, and electrically-operating devices in each station connected with the wires normally belonging to the other stations, and arranged to be operated from any other station over the wire normally apportioned to the calling station to connect the last-mentioned wire with the main-line wire normally belonging to the called station,

through the telephone instruments in the called station, to establish a closed metallic circuit in the called station between the main-line wires that are normally apportioned to the calling and called stations.

3. In a calling system having a plurality of stations, a plurality of wires passing through said stations, each wire being normally apportioned to one station, calling devices, and electrically-operating circuit-closing devices in one station, and means in another station for operating the calling devices in one station over the wire belonging to the latter station and at the same time closing the circuit for said circuit-closing devices in the called station, and means in the calling station to operate the corresponding circuit-closing devices in the called station over the wire belonging to the calling station to thereby connect the main-line wires normally apportioned to the calling and called stations.

4. In a telephone system having a plurality of stations, a plurality of wires passing through said stations, each wire being normally apportioned to one station, telephone instruments in each station, calling devices in each station, means in one station for giving a call in another station over the wire belonging to the latter station, and electrically-operating devices in each station connected with the wires normally belonging to the other stations, means in each station arranged to select the wire belonging to any other station and means to actuate the corresponding electrically-operating devices in the calling station to connect the wires belonging to a calling and a called station through the telephone instruments in the calling station, and means to send a current over the wire belonging to the calling station to operate the circuit-closing devices in the called station corresponding to the calling station, to connect the wires belonging to the calling and called stations through the telephone instruments in the called station, whereby a closed metallic circuit is formed through the wires normally apportioned to a calling and a called station and through the telephone instruments in said stations.

5. In a telephone and calling system having a plurality of stations, a plurality of wires passing through said stations, each wire being normally apportioned to one station, telephone instruments in each station, signaling or calling instruments in each station, means connected with the wire belonging to a station for operating the calling instruments in that station, circuit-closing devices in each station connected with the wires belonging to the other stations adapted to close the circuit in a station through the telephone instruments therein between the main-line wires normally belonging to a calling and a called station, a circuit-closer in each station arranged so that at one operation an impulse will be sent over the main-line wire belonging to another station to operate the calling

instrument in the latter station and to close the circuit of the corresponding circuit-closing devices therein, and to send an impulse to the latter station over the main-line wire 5 belonging to the calling station to close the circuit in the called station between the main-line wires belonging to the calling and the called stations.

6. In a telephone and calling system having a plurality of stations, a plurality of wires 10 passing through said stations, each wire being normally apportioned to one station, signaling or calling instruments in each station, normally open spur-circuits in each station 15 leading from the main-line wires normally belonging to the other stations, means in each station adapted to be operated from another station for closing the circuit of said normally open spur-wires, magnets on said spur-wires, 20 telephone instruments in said stations connected with the main-line wires normally belonging to the corresponding station, a wire in each station leading from its telephone instruments and having contacts corresponding 25 to the other station, and electrically-operat-

ing devices in each station adapted to be operated by the magnets on said spur-circuits for closing the circuit between any one of the main-line wires normally apportioned to any station and the wire leading from the telephone instruments in a called station, to establish a closed metallic circuit in a station 30 between the main-line wires that are normally apportioned to a calling and a called station, and means in each station adapted to operate 35 the calling instruments in another station over the main-line wire belonging to the latter station and to thereupon close the circuit in the latter station of the spur-wire connected with the calling station, and to simultaneously 40 operate the circuit-closing devices in the called station over the main-line wire belonging to the calling station.

Signed at New York city, New York, this 5th day of February, 1896.

JAMES G. SMITH.

Witnesses:

T. F. BOURNE,
L. ADAMS.