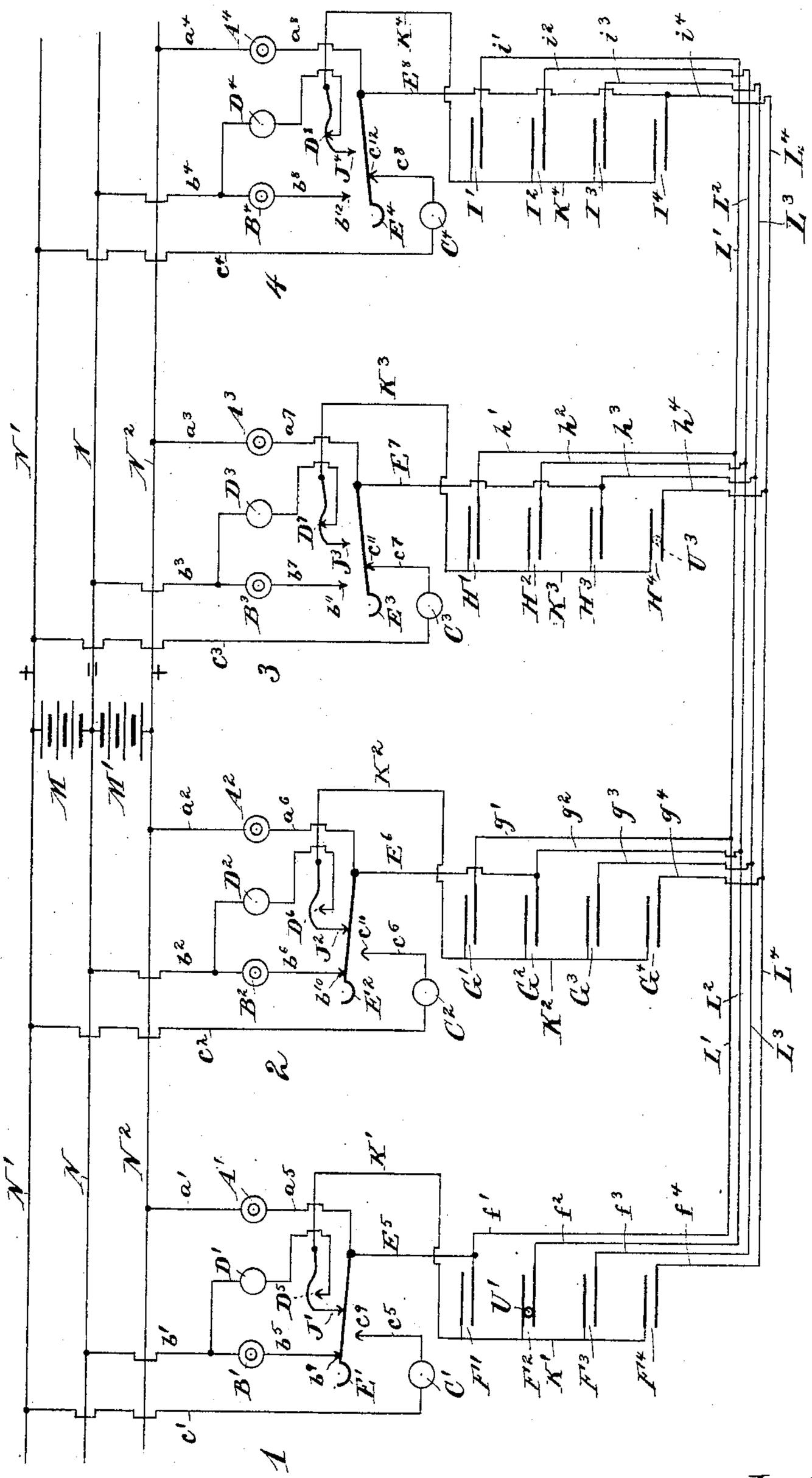
No. 785,728. PATENTED MAR. 28, 1905.

A. C. GILGEN.

TELEPHONE SYSTEM.

APPLICATION FILED JUNE 11, 1904.



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No. 785,728. Patented March 28, 1905.

UNITED STATES PATENT OFFICE.

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TELEPHONE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 785,728, dated March 28, 1905.

Application filed June 11, 1904. Serial No. 212,104.

To all whom it may concern:

Be it known that I, ADOLPH C. GILGEN, a citizen of the United States, residing in Passaic, in the county of Passaic and State of New Jersey, have invented a certain new and useful Improvement in Telephone Systems, of which the following is a specification.

The invention relates to that class of telephone systems in which a central station is dispensed with and each subscriber is enabled to call and communicate directly with any other subscriber on the system.

The object of the invention is to provide a simple arrangement of centrally-energized calling and talking circuits forming a system in which the necessity for complicated selecting devices is avoided and which shall be non-inductive and of high efficiency.

The invention consists in the arrangement of circuits and location therein of calling, transmitting, and receiving devices by which the above objects are attained, to be hereinafter described.

The accompanying drawing forms a part of this specification and shows diagrammatically a system of four stations and the circuits therefor.

The stations are for convenience designated by the numerals 1, 2, 3, and 4, from left to right, and are all similarly equipped and wired. Stations 1 and 2 are shown as conditioned for talking, and 3 and 4 are normal or temporarily idle and conditioned for calling. There may be any number of stations similarly connected. Each station is equipped with a transmitter, receiver, call-bell, and a return signal or alarm, which will be described as a "buzzer" to distinguish it from the bell, also a receiver hook or switch and four jacks, one for each station, all of which may be of any ordinary or approved types. The transmitters are marked A′, A², A³, and A⁴, the receivers B′ B², &c., the bells C′ C², &c., the buzzers D′ D², &c., and the hooks E′ E², &c. The jacks for station 1 are marked F′, F², F³, and F⁴; for station 2 G′ G², &c., and for stations 3 and 4 H and I, with corresponding supernumerals. The battery is of two cells or series of cells M M′. The negative-pole electrodes of both are connected to a single wire N, indicated by the minus sign —, and each positive-pole electrode to a separate wire, indicated by the plus sign +, such independent wires being marked N′ and N², respectively. A wire *c′* leads from the wire N′ at station 1 to the bell C′, and from the bell a wire *c*⁵ leads to a contact-point *c*⁹ with the hook E′ when the latter is depressed or normal. A wire *b′* leads from the negative wire N to the receiver B′, and from the latter extends a wire *b*⁵ to a contact *b*⁹, broken when the hook is depressed. A wire *a′* leads from the positive wire N² to the transmitter A′ and thence by wire *a*⁵ to a permanent connection with the hook.

J′, J², J³, and J⁴ are spring contact-pieces, one at each station in contact each with its hook, arranged to break such contact when the hook is in the normal or depressed position and when thus broken to make contact with the several contact-points D⁵, D⁶, D⁷, and D⁸ through shunt-circuits with the wires *b′* *b*², &c., such contact being broken when the spring contact-pieces are lifted by the raising of the hooks. From each spring contact-piece a wire K′—at station 1, for example—connects to one arm of each jack F′ F², &c., of that series, and each station is similarly equipped with such wires, (marked, respectively, K², K³, and K⁴.) The opposite arms of the jacks of each series are connected to those of all the other series bearing the same supernumerals by line-wires L′, L², L³, and L⁴ and by wires *f′*, *f*², *f*³, and *f*⁴ for the first series, *g′* *g*², &c., for the second station, and *h* and *i*, with same supernumerals, for stations 3 and 4, respectively, and from the hook at each station a permanently-connected wire, as E⁵ E⁶, &c., leads to such opposite arm of the jack bearing as a supernumeral the number of the station, as at station 3 the wire E⁷ leads to the jack H³.

Having thus indicated the wiring and equipment, it remains to follow the circuits under the several conditions as developed in practice. The bell-circuit will be first described, and will be more easily followed by referring

to stations 3 and 4 in the diagram. Supposing station 3 to call station 4, the caller inserts the plug indicated by the dotted circle at U^3 into the jack H^4, and thus completes a circuit beginning, for convenience of description, at the positive wire N′, through the wire c^4 to the bell C^4 at station 4, through c^8, c^{12} to hook E^4, thence through wires E^8 and i^4 to line-wire L^4, to wire h^4 and jack H^4 at station 3, thence by wire K^3 to spring contact-piece J^3 and shunt D^7 and buzzer D^3 to wire b^3, between the receiver and battery, and to the negative-pole wire N of the battery, thus ringing bell C^4 at the called station 4 and buzzer D^3 at the calling-station 3. The buzzers are preferably without commutators and vibrate in unison with the bells. It will be observed that a connection exists between the hook E^4 through the wire a^8, transmitter A^4, and wire a^4 to the wire N^2; but as this is also positive and therefore neutral this circuit is of no effect, and as the transmitter resistance is higher than that of the bell there is no objectionable reverse action. The bell at the called station continues to ring until the hook E^4 is released, this condition being announced at the calling-station by the cessation of the buzzer action. If station 4 should be "busy" and the hook E^4 already released at the time of call, the circuit will be incomplete at c^{12}, and neither the called bell nor the calling-buzzer will operate; but so soon as the hook E^4 is again depressed by hanging up the receiver or otherwise the called bell will immediately ring and the calling-buzzer respond, to again cease when the called receiver is again detached and hook E^4 allowed to rise, thus notifying the caller that station 4 is ready for talking.

The talking-circuit is exemplified at stations 1 and 2. Station 1 has called station 2 by the insertion of plug U′ in jack F^2 in the manner just described, and the hooks E′ and E^2 are released by the parties in communication, the bell-circuit being broken. Beginning at the positive-pole wire N^2 through wire a' at station 1, transmitter A′ and wire a^5 to hook E′, thence through spring contact-piece J′ and wire K′, through plug U′ and jack F^2 and wire f^2 to line L^2 and wire g^2 at station 2, wire E^6, hook E^2, wire b^6 to receiver B^2, thence by wire b^2 to negative wire N, thus completing the circuit. The wire a^6 a^2, in which the transmitter A^2 is located, is ineffective, because it leads to the wire N^2, which is also positive. The circuit from the positive-pole wire N^2 through wire a^2 and transmitter A^2 at station 2, through the line L^2 to the receiver B′ at station 1, and negative-pole wire N is in all respects similar.

The local path offered at each of the two stations 1 and 2 from the positive-pole wire N^2 through each local transmitter, hook, and receiver to the negative-pole wire N does not interfere with the action of the transmitter, because although the current divides between the receivers at the two talking-stations it passes unobstructedly through the transmitter before such division takes place. By reason of this arrangement the transmitter is rendered "antiside tone" and capable of efficient service in noisy situations, as against the common arrangement in which the transmitters and receivers are in series, the resistance of such receivers affecting the transmission. The transmitter at station 1 is in direct series with the receiver at station 2, with no resistance in the circuit other than that of the line-wire. The same is true of any two stations in either direction. The wire leading from the hook at each station to the correspondingly-numbered jack is continued to the similarly-numbered line-wire and may be a direct connection between such hook and wire, omitting such jack. The advantage in the connection to the jack, as shown, is that by inserting the plug in the home-station jack the subscriber may ring his own bell, and thus test the conditions at his own station.

It will be noted that the transmitter of the transmitting-station is in series with the receiver at the receiving-station—a condition conducive to the attainment of the highest degree of efficiency.

The system is "non-inductive" by reason of the normally closed transmitter-circuit, the induced currents traversing the low-resistance circuit and avoiding the higher-resistance path—that is to say, induction is not neutralized through methods of transposition or crossing of wires, but is nullified on the receiver-circuit, because it is shunted by the low-resistance closed transmitter-circuit, as the induced current traverses the positive pole of the battery-circuit and through both transmitters making a "same-pole" closed circuit. The negative pole of the battery is similar relatively to the receivers, although the latter are of higher resistance than the former (the transmitter) circuit. For the purposes of this description I will assume that the transmitter resistance is thirty ohms, the receiver one hundred ohms, and the bell and buzzer each two ohms. For example, the receiver-circuit (two hundred ohms,) as will be observed, has a closed path along the negative battery-wire, which places the two receivers in series with the negative battery-wire and the line, and the transmitter-circuit (sixty ohms) is parallel with the above, but uses the positive battery-conductor and the line and offers only about one fourth the resistance, thus serving as a shunt to the receiver-circuit for carrying induced currents.

The arrangement of the bell-circuit and its contacts with the spring contact-piece and hook produces an automatic ringing without requiring the holding down of a push-button or an analogous device, and on the release of the hook at either the called or calling station the ringing of both bell and buzzer ceases.

It will be understood that any number of stations may be connected, the four shown being selected merely for convenience of illustration and description.

Any form of receiver-hook or suitable switch will serve successfully and the contact-pieces J' J^2, &c., and points D^5 D^6, &c., may be of any suitable construction adapted to make and break the circuits as required.

I claim—

1. In a telephone system comprising a plurality of stations, a battery common to all such stations, and at each station a bell, a return-alarm, a receiver-hook normally depressed, a contact-piece controlled by the movements of said hook and arranged to break contact with said hook and to contact with said return-alarm when said hook is depressed and to contact with said hook and to break contact with said return-alarm when said hook is raised, and a plurality of jacks, and a calling-circuit from one pole of said battery through the bell and hook at the called station to a line connecting said called and calling stations, through one of the jacks, contact-piece and return-alarm at the calling-station, to the opposite pole of said battery, whereby the called bell and calling-alarm both are conditioned to ring when said hooks are depressed and to cease when either hook is raised.

2. In a telephone system comprising a plurality of stations, lines between such stations, a battery common to all such stations, and at each station a transmitter, receiver, receiver-hook, and a plurality of jacks, a talking-circuit from one pole of said battery at each of two communicating stations, through its transmitter, hook, line-wire, and jack at one station, and hook and receiver at the other station, to the opposite pole of said battery.

3. In a telephone system comprising a plurality of stations, a battery common to all such stations, a transmitter, a receiver, receiver-hook and a plurality of jacks at each station, a connection from one pole of said battery to the transmitter at the talking-station, a connection from the same pole to the transmitter at the receiving-station, a connection from each of said transmitters to its receiver-hook, a connection at each station from the opposite pole of said battery to the receiver at such station and from each of said receivers to its receiver-hook, and a line between said hooks, whereby the current through said transmitter at said talking-station divides beyond such transmitter, one portion traversing the line to and through the receiver at said receiving-station, and the other portion traversing said receiver-hook and receiver at said talking-station.

4. In a telephone system comprising a plurality of stations, a battery common to all such stations and consisting of two series of cells, a single wire in connection with the two similar poles of both series, two independent wires, one connected to the opposite pole of one series and the other to the same pole of the other series, one of said independent wires serving for the calling-circuits and the other for the talking-circuits, a transmitter, receiver, receiver-hook, a plurality of jacks and a bell at each station, line-wires connecting said stations and controlled by said jacks, connections from one of said independent wires to said bells, connections from the other independent wire through said transmitters, receiver-hooks and line-wires to said receivers, and connections from said bells and from said receivers to said single wire, whereby the latter serves as a common return for both calling and talking circuits.

5. In a telephone system comprising a plurality of stations, a battery common to all such stations and consisting of two series of cells, a single wire in connection with the two similar poles of both series, two independent wires, one connected to the opposite pole of one series and the other to the same pole of the other series, one of said independent wires serving for the calling-circuits and the other for the talking-circuits, a transmitter, receiver, receiver-hook, a plurality of jacks and a bell and return-alarm at each station, line-wires connecting said stations and controlled by said jacks, connections from one of said independent wires to said bells and through said line-wires to said return-alarms, connections from the other of said independent wires through said transmitters, receiver-hooks and line-wires to said receivers, and connections from said return-alarms and from said receivers to said single wire, whereby the latter serves as a common return for both calling and alarm, and talking-circuits.

6. In a telephone system comprising a plurality of stations, a battery common to all such stations, and at each station a bell, a return-alarm, a receiver-hook arranged to be depressed by a receiver, a transmitter, a contact-piece controlled by the movements of said hook and arranged to break contact with said hook and to contact with said alarm when said hook is depressed, and to contact with said hook and to break contact with said alarm when said hook is raised, and a plurality of jacks, a calling-circuit completed through one of said jacks with a called station, and comprising a wire as c^4 from one pole, as +, of said battery to a bell C^4, a wire c^8 from the latter to contact c^{12} with hook E^4 when said hook is depressed, a wire E^8 i^4 at the called station to a line L^4, thence by wire h^4 at calling-station to jack H^4, through wire K^3 to contact-piece J^3, contact D^7, return-alarm D^2 and wire b^3 to the opposite pole, as —, of said battery, a wire a^4 at said called station from said +pole of said battery to transmitter A^4, wire a^8 and said hook E^4 at said called station, a connection from wire b^4 to receiver B^4, wire b^8 and contact-point b^{12} arranged to contact

with said hook E^4 at said called station when said hook is raised, a wire a^3 at said calling-station from said +pole of said battery to transmitter A^3, wire a^7 and said hook E^3 at said calling-station, a connection from said wire b^3 to receiver B^3, wire b^7 and contact-point b^{11} arranged to contact with said hook E^3 at said calling-station when such hook is raised, all combined and arranged to serve substantially as and for the purposes herein specified.

In testimony that I claim the invention above set forth I affix my signature in presence of two witnesses.

ADOLPH C. GILGEN.

Witnesses:
CHARLES R. NEWMAN,
CHARLES R. SEARLE.