(No Model.) 4 Sheets—Sheet 1.

I. KITSÉE.

TELEPHONE SYSTEM.

No. 430,960. Patented June 24, 1890.

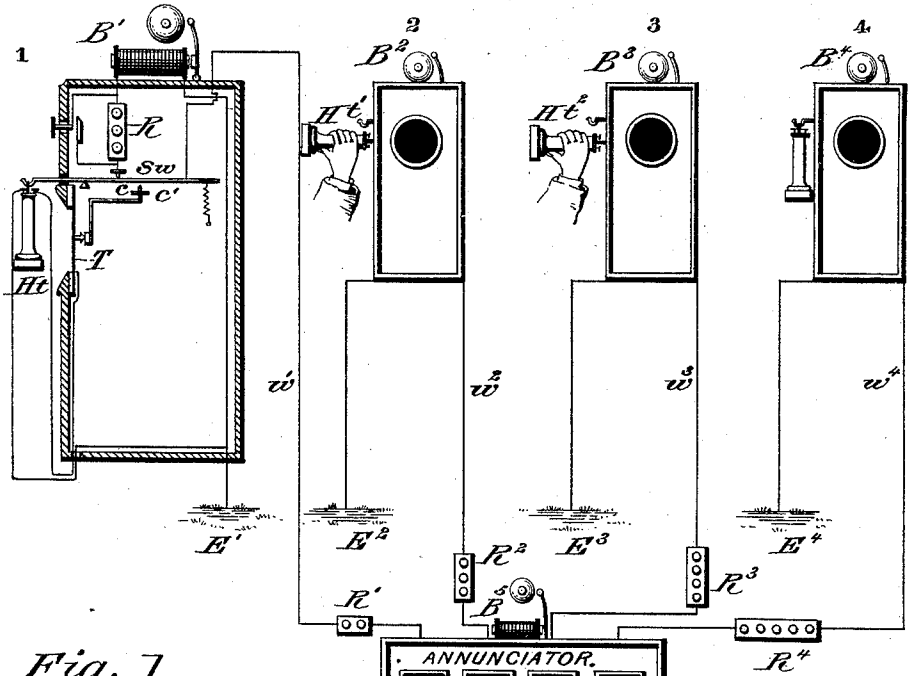
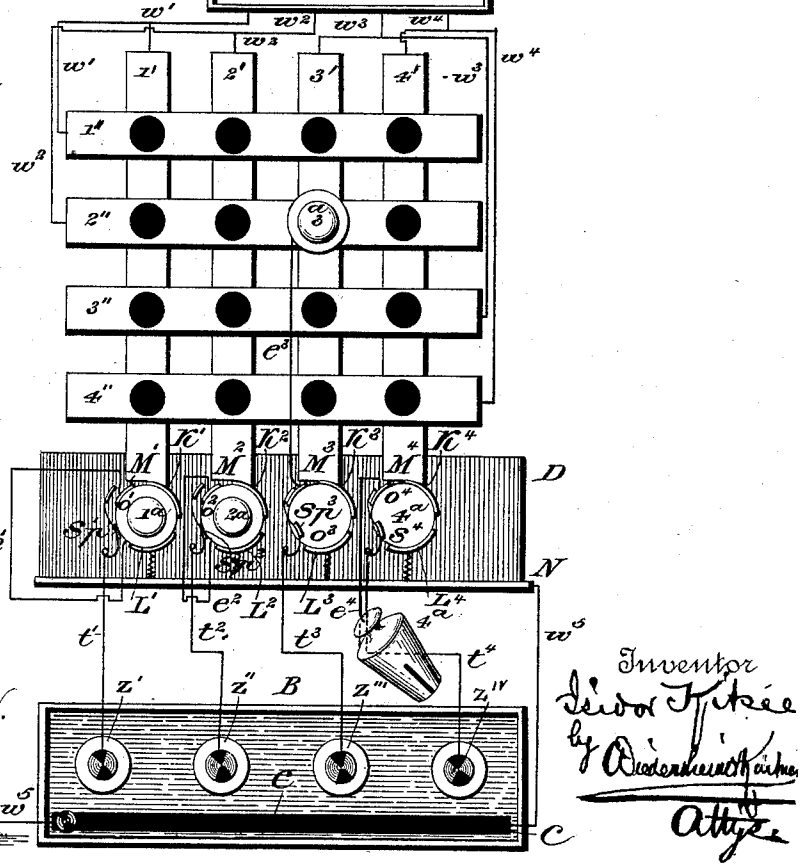


Fig. 1.



Witnesses
P. F. Dagle.
L. Dowville

Inventor
Isidor Kitsée
by Wedderburn & Carter
Attys.

(No Model.) 4 Sheets—Sheet 2.

I. KITSÉE.

TELEPHONE SYSTEM.

No. 430,960. Patented June 24, 1890.

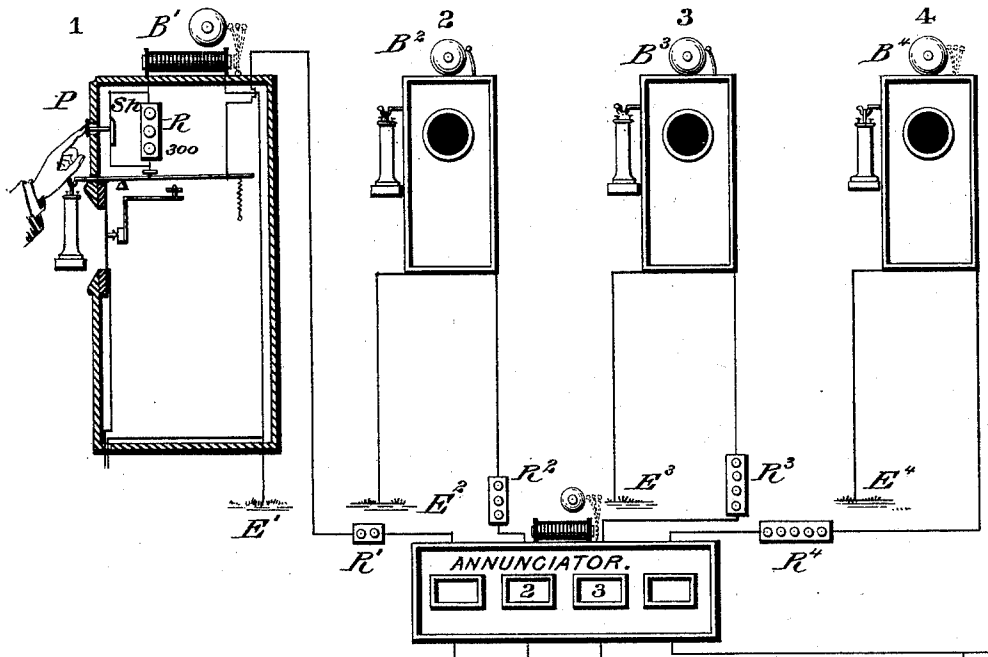
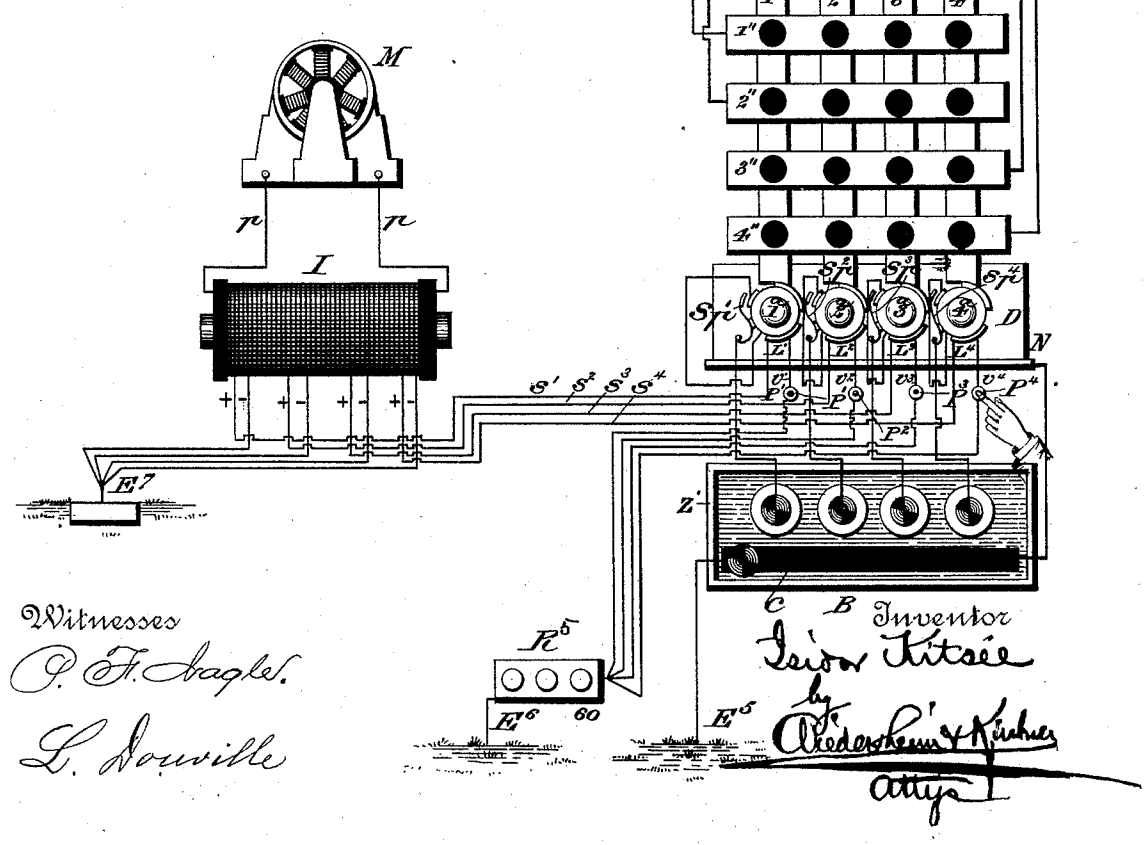


Fig. 2.



Witnesses
P. F. Dagle.
L. Douville

Inventor
Isidor Kitsée
by Cleveland Dodge & Parker
Attys

(No Model.) 4 Sheets—Sheet 3.

I. KITSÉE.

TELEPHONE SYSTEM.

No. 430,960. Patented June 24, 1890.

Fig. 5.

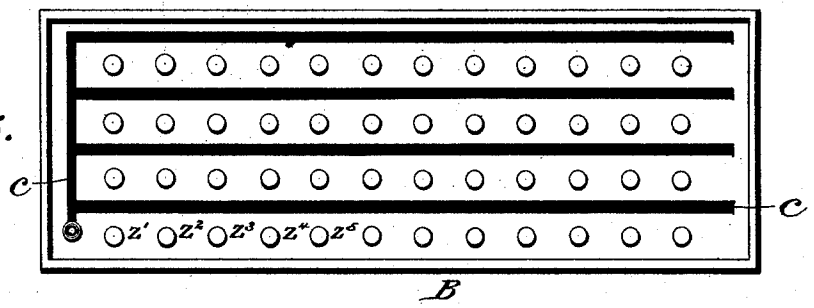


Fig. 6.

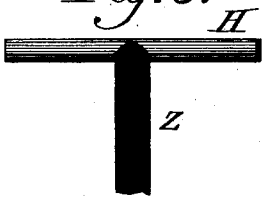


Fig. 7.

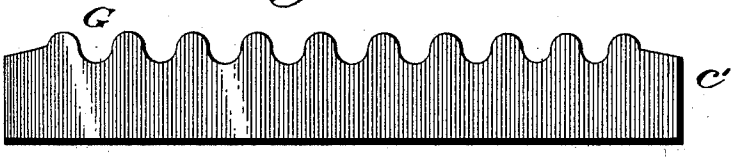


Fig. 8.

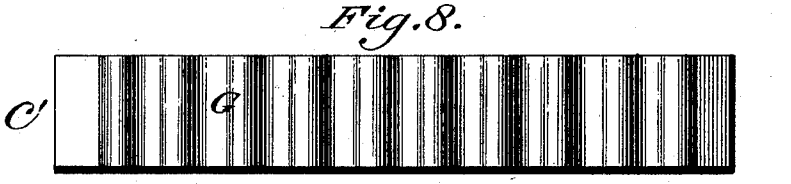


Fig. 4.

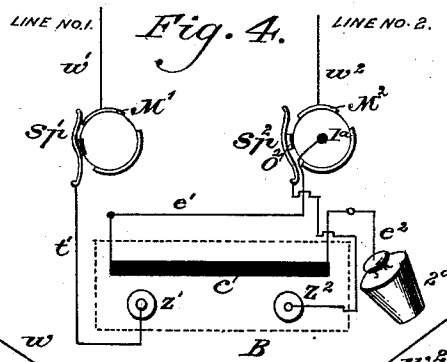


Fig. 3.

Witnesses

A. P. Jennings.

L. Douville

Inventor

Isidor Kitsée,

by Wiedersheim & Kintner

Attys.

(No Model.)

4 Sheets—Sheet 4.

I. KITSÉE.

TELEPHONE SYSTEM.

No. 430,960. Patented June 24, 1890.

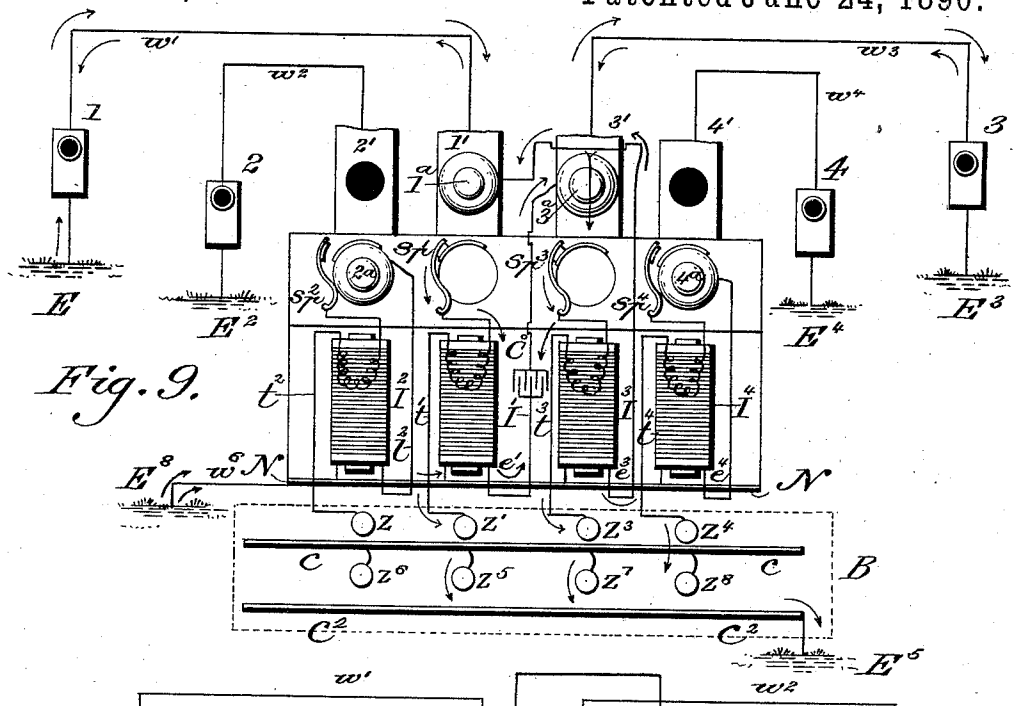


Fig. 9.

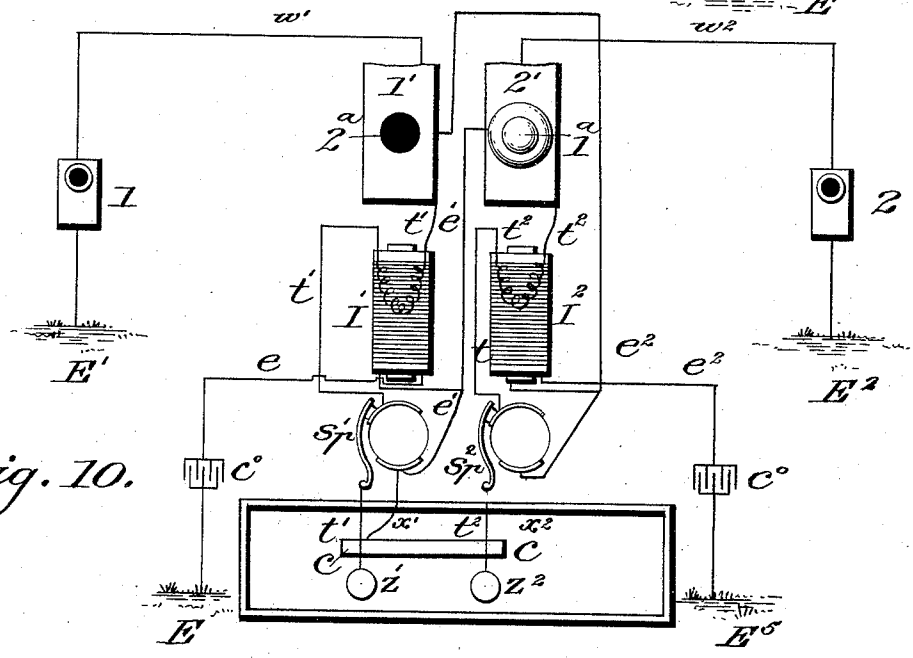


Fig. 10.

Witnesses
P. T. Eagle.
L. Douville

Inventor
Isidor Kitsée
by
Dickerson & Kittner
attys.

UNITED STATES PATENT OFFICE.

ISIDOR KITSEE, OF CINCINNATI, OHIO, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF ONE-HALF TO JEROME CARTY AND JOHN A. WIEDERSHEIM, OF PHILADELPHIA, PENNSYLVANIA, AND CHARLES J. KINTNER, OF NEW YORK, N. Y.

TELEPHONE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 430,960, dated June 24, 1890.

Application filed October 25, 1887. Serial No. 253,299. (No model.)

To all whom it may concern:

Be it known that I, ISIDOR KITSEE, a citizen of the United States, residing at Cincinnati, in the county of Hamilton, State of Ohio, have invented a new and useful Improvement in Telephone Systems, which improvement is fully set forth in the following specification and accompanying drawings.

My invention relates to improvements in telephone systems; and its objects are, first, to provide a system of telephonic lines with a generator of electricity located at the central station which shall furnish all the electricity required for all outlying stations, thus centralizing the battery and at the same time place it where it will be under the absolute control of a person located at the central office; second, to provide means for producing electricity for operating all the call-bells in both the outlying stations and the central office, which means shall be located wholly within the central office and under the control of operators there, and, third, to provide means for connecting up the circuits between the several subscribers adapted for use with my improved system.

To these ends it consists in the special features hereinafter described, and particularly pointed out in the claims which follow this specification.

It is one of the especial features of my invention that no interruption occurs to talking-lines while others are being cut in and out at the central station, and thus by reason of the fact that each subscriber works with an independent current of electricity, which can in no way affect any other subscriber's instrument than the one to whom he desires to talk.

A full understanding of my invention can best be had from the following description, taken in connection with the accompanying drawings, in which—

Figure 1 represents a diagrammatic view of my improved system with the talking-battery of all the subscribers located at the central office. Fig. 2 is a similar view of the call apparatus with the electrical generator for all the subscribers located at the central office. Fig. 3 represents a diagrammatic view showing the relation of the transmitters at the outlying stations to the talking-battery for all the lines located at the central office only. Fig. 4 represents a diagrammatic view of a modified form of circuit-connections, such that the talking-battery is connected in the direct circuit between the two lines in use, and not in a multiple-arc earthed circuit, as shown in Fig. 3, where there are three earth-connections. Fig. 5 represents a horizontal sectional view of my novel form of battery for central office use. Fig. 6 represents a detail view showing one of the zincs and its hanger. Figs. 7 and 8 represent, respectively, sectional and plan views of a rubber cap for covering the carbons and sustaining the zincs. Fig. 9 represents a diagrammatic view of my improved system as used with induction-coils located with the battery at the central station. Fig. 10 represents a similar view showing the battery connected directly between outlying lines supplied with induction-coils and bearing the same relation to Fig. 9 that Fig. 4 does to Fig. 1.

Similar letters of reference indicate corresponding parts in the several figures.

I will now describe the talking system and battery connected therewith, as well as its mode of operation, after which I will describe the call system and its operation.

I will remark at the outset that the talking and call systems are designed to be used together, and are only shown separately in Figs. 1 and 2 to avoid confusion of parts.

Fig. 1 illustrates the talking system, in which 1, 2, 3, and 4 indicate four independent outlying stations having contact telephone-transmitters with ordinary Bell receivers, located directly in each circuit earthed, respectively, at E' E^2 E^3 E^4, and connected by line-wires w' w^2 w^3 w^4, through the annunciator and bell, to the central station and the switch-board, as shown.

The arrangement as described so far is not essentially different from existing systems of telephones, in which the talking is done by

direct battery-currents without the intervention of induction-coils. T being the transmitter, Ht the hand-telephone, and Sw the telephone switch-lever for changing the circuit at the points C and C′ from the call-circuit to the talking-circuit.

Each line has at the central station an adjustable rheostat R′, R², R³, or R⁴, adapted to make the outlying lines of equal resistance, so as to cause the telephone-transmitter to work with equal effect under all conditions.

The switch-board has the usual cross-bars 1′ 1″ 2′ 2″, &c., to which are connected, as shown, the outlying lines.

To the lower ends of the vertical bars 1′ 2′ 3′ 4′ is affixed an insulating-board D, having metal bearings K′ K² K³ K⁴, which are in electrical contact, respectively, with said bars, or may be integral therewith. They are curvilinear in shape, and adapted to form bearings for the switch-plugs 1ª 2ª 3ª 4ª when in position in the plug-holes passing through the board D.

L′ L² L³ L⁴ and M′ M² M³ M⁴ are similar curvilinear strips disposed as shown, so as to have metallic contact with the plugs 1ª 2ª 3ª 4ª, respectively. The strips L′ L² L³ L⁴ are connected by wires to a metal bar N, which in turn is connected to earth at E⁵ by a wire w^5 and carbon C of the battery B. The strips M′ M² M³ M⁴ are connected by wires e' e^2 e^3 e^4 to switch-plugs 1ª 2ª 3ª 4ª, respectively.

Sp′ to Sp⁴ are metal springs having contacts at their upper ends for contacting electrically with the strips M′ M² M³ M⁴. They are connected at their fixed ends to wires t' t^2 t^3 t^4, which in turn are connected each to its own zinc z' z^2 z^3 z^4 of the battery B.

On the springs Sp′ to Sp⁴ are insulating-blocks o' to o^4, which contact with plugs 1ª to 4ª and electrically disconnect the zincs from the circuit, so as to leave the battery on open circuit at all points when all of the switch-plugs are in place, as shown at 1ª 2ª.

The operation of the talking system is as follows: In Fig. 1 I have shown stations numbers 1 and 4 as not in use, while stations 2 and 3 are conversing. When the lines are not in use, all of the plugs 1ª 2ª 3ª 4ª are in place on the board D, and all of the springs Sp′ Sp⁴, inclusive, are held away from the contact-stops on springs M′ to M⁴, and there is no battery in circuit on any of the lines.

I have not shown any telephone at the central station, nor the customary switch-strips for such telephone; but it will be understood that such feature is well known, and any desired connection may be made with my system.

Supposing station 2 to have called central station by the apparatus which I will disclose later on, and to have announced that he desires to talk to station No. 3, the central-station operator first calls station No. 3, and then withdraws plug 3ª from the plug-hole in board D and inserts it in the holes of cross-bar 2″ and 3′. This connects lines w^2 and w^3 in multiple arc with the zinc z^3, carbon C, and wire w^5 to earth E⁵, the other earth-connections being at the local stations at E² E³. The circuit is as follows: from earth E⁵ by wire w^5 to carbon C, thence to zinc z^3, wire t^3, spring Sp³, strip M³, wire e^3, plug 3ª, where it divides, one part going by horizontal strip 2″ to wire w^2, through annunciator and line w^2 to station 2 and earth E², while the other half takes the vertical strip 3′, wire w^3, annunciator, and line w^3 to station 3, and earth at E³. I have shown in Fig. 3 a diagrammatic view of the relation of the battery to the two lines in connection with the transmitters and receivers at stations 2 and 3. It will be seen that any variation of the line-current at either of the transmitters will change the potential of the circuits, and hence actuate the receiver at the other stations. Should 1 and 4 desire to talk, it would only be necessary to insert the plug 1ª at the plug-hole at the junction of vertical bar 4′ or plug 4ª at the plug-hole of vertical bar 4′, and horizontal bar 1′; or, if desired, both plugs may be inserted, when the two zincs z' and z^4 will do service on both lines. Similarly both zincs z'' and z''' might be connected to lines 1 and 4 for service. With this arrangement of battery each subscriber has his own independent current, and no subscriber's circuit can in any way interfere with that of any other. The carbon C is of sufficient surface, length, and thickness to furnish a negative electrode for all of the zincs.

I have shown in Fig. 5 a sectional view of a battery designed for use with forty-eight subscribers. Here the carbon C is made of three sections having a common connection to a binding-post, and the zincs—forty-eight in number—are suspended in the solution by hangers H, (shown in Fig. 6,) which rest in grooves G of a rubber or other insulating cap C′, adapted to fit snugly over the top of the carbons. These zincs have the usual binding-posts and connections to the independent lines, as shown and described in connection with Fig. 1.

In Fig. 4 I have shown an arrangement for connecting my improved form of battery directly in line between two subscribers, the operation of which I will now describe. Two lines only are shown, numbered 1 and 2, and the parts are lettered the same as in Fig. 1. Supposing station No. 1 to have called station No. 2 and central office to have made the connections shown, the circuit is as follows: From station 1 by line-wire w' to strip M′, spring Sp′, wire t' to zinc z' of battery, thence to the common carbon C and by wire e' to plug 1ª, strip M², line-wire w^2 to station 2, the battery being directly in circuit between said stations. In this instance plug 2ª is left hanging from its support and zinc z^2 is on open circuit. This arrangement is designed for use on longer circuits than that disclosed in Fig. 1.

The system which I have just described is

applicable only on direct-circuit lines of telephones—that is to say, on lines where the transmitter and receiver are in one common battery-circuit. Such systems are only used, I believe, in small villages, or where low-tension currents are sufficient.

I will now describe a modified system applicable to such telephone-circuits as are in general use in large cities, where the transmitter of each local subscriber is in a local-battery circuit situated in the telephone-box and embracing the primary of an induction-coil, while the secondary goes to line and to the central station, where the usual switch mechanism is provided for connecting up subscribers.

It is the function of the modification I now propose to describe to do away with all local batteries, induction-coils, and, in short, every portion of the present form of local instrument except the contact-transmitter, hand-telephones, and call-bell magnets, thus reducing the mechanism in the subscriber's box to a minimum and leaving only such parts as are not easily disadjusted. I also arrange my connections at the central station, so as to simplify the switch-connections, using only vertical switch-bars and plugs therefor without horizontal switch-bars, thus doing away with the usual form of switch-board.

It will be better understood by referring to Fig. 9, where 1, 2, 3, and 4 are local stations analogous to those shown in Figs. 1 and 2, and having the internal construction in the boxes shown in station 1, Figs. 1 and 2.

The battery B is located at the central station, and is essentially the same in its construction as those I have heretofore described, except that I have shown here two carbons and two sets of zincs connected in sets of two for tension, so as to get currents of higher tension in the outlying lines.

$1'$ $2'$ $3'$ $4'$ are vertical switch-bars, one for each outlying line, having the usual plug-holes.

I' I^2 I^3 I^4 are induction-coils located below the switch-board and having their primaries connected, respectively, to the springs Sp' Sp^2 Sp^3 Sp^4 by wires t' t^2 t^3 t^4, said wires going each to its individual zinc z' z^2 z^3 z^4, &c., the carbons C C′ of which are connected by a common earth-wire to earth at E^5. The secondary coils of I' I^2 I^3 I^4 have a common earth-wire running to earth at E^6 from the metal plates, while their free ends are connected by wires e' e^2 e^3 e^4 to the switch-plugs 1^a 2^a 3^a 4^a, respectively. These plugs, when all inserted in the lower rows of holes, keep the battery normally open, as explained in connection with Fig. 2, when the call-service only is in circuit.

In Fig. 9 I have shown two of the plugs in service in the switch-board connecting stations 1 and 3 over wires w' and w^3, while lines w^2 and w^4 are idle.

The operation is as follows: Supposing station 1 to have called for and obtained station 3, the necessary switch-plugs 1^a and 3^a having been placed by central-station operator in switch-bars $1'$ and $3'$, the circuits are as follows: The hand-telephones are off the hooks at stations 1 and 3, and the battery-circuit from station 1 to central station is, as shown by the full arrows, from earth E at station 1 to and through the transmitter to line w', bar $1'$, spring Sp', primary of induction-coil I', wire t', zinc z', carbon C, zinc z^5 carbon C^2 to earth at E^5 back to starting-point. Any variation of the transmitter of station 1 sets up corresponding variations in the primary of the induction-coil to line w^3 and receiver at station 3, as shown by the tailless arrows, as follows: From earth E^3, by wire w^6, metal plate N, secondary coil of I', wire e', condenser C°, switch-plug 3^a, bar $3'$, wire w^3, hand-telephone and transmitter at station 3, and thence to earth at E^3, where it returns to starting-point by earth-circuit to earth-plate E^6. Thus any primary impulses set up in coil T′ are repeated in the receiver at station 3. The back-talking circuit from the earth-plate E^6, station 3, is shown by the full arrows, and passes through wire w^3, bar $3'$, spring Sp^3, primary of induction-coil I^3, to wire t^3, zincs z^3, carbon C, zinc z^7, carbon C^2, to earth, and back to earth-plate at station e. Thus each operator has a talking-circuit through batteries and induction-coils located wholly at the central station and under the exclusive control of the central-station operator. By an entirely similar use of plugs 2^a and 4^a stations 2 and 4 may be connected and the subscribers carry on conversation without interfering with other subscribers.

Of course it will be understood that condensers may be used in all the secondary circuits analogous to that in wire e', or they may be omitted, if desired, it being understood that the resistance of the secondary circuits is so high as to take practically no current from the direct or battery circuit. It will also be understood that the lines w' to w^4 may be balanced up with rheostats, the same as in Figs 2 and 3.

With the system shown in Fig. 9 I make the central office substantially a repeating-station and utilize earth-circuits for both the primary and secondary circuits, although it is apparent that all-wire circuits might be used, if desired, in a manner at once obvious to those skilled in the art. By this arrangement I simplify the central-office switch-board connections and place all the apparatus, including batteries, induction-coils, call apparatus, in one compact space and under the direct control of an experienced operator or operators.

In Fig. 10 I have shown an arrangement for connecting two outlying stations, so that the transmitting-battery lies directly in the line between the two stations.

The transmitting-circuit from station 1 embraces wire w', bar $1'$, wire t', primary of coil I', spring Sp', zinc z', carbon C, wire t', wire e', plug 1^a, bar $2'$, wire w^2 to station 2 and

earth E^2. The secondary circuit acts from earth-plate E^5, through condenser C^6, wire e', secondary coil of induction-coil I', where it joins the primary current and goes to station 2 by wire w^2, and thence to earth. Similarly the talking-circuit from station 2 passes by the primary of induction-coil I^2, battery switch-plug 2^a, and wire w' to station, and the scondary circuit passes from earth-plate E^5, by the secondary coil, to line w' and receiver at station 1; hence the two subscribers can talk back and forth.

Of course I do not limit myself to the use of single stations on a single line, as there may be several subscribers on each line.

I will now describe my calling apparatus as illustrated fully in Fig. 2.

The diagrammatic view shown in this figure is a duplicate of Fig. 1, with the call apparatus added, and all the switch-plugs in their normal position in the insulated board D, so that the circuit from the individual zincs of the battery are all open at the contacts of springs Sp' to Sp^4.

M is an alternating-current magneto-generator of the Siemens type, or any other preferred form, located at the central station, and having its poles connected in a closed circuit by the wires $p\ p$ to the primary coil of an inductorium or converter I. This converter has a series of secondary coils disposed about the primary circuit, equal in number to the number of outlying stations connected to the central office. These secondary coils are all earthed by a common earth-wire at E^7 on one side, and connected by wires S' to S^4, inclusive, to the metal strips L' to L^4, respectively, and thence by wires V' to V^4, through push-buttons P' to P^4, to and through an adjustable rheostat R^5 and earth-wire to earth at E^6.

In each telephone-box at the outlying stations is located an adjustable rheostat of much greater resistance than the rheostat R^5. Let the one at the box be, say, three hundred ohms and that at the central station sixty ohms. There is also a shunt Sh in each box of low resistance around the box-rheostat, and a push-button P adapted to close the shunt.

I will now describe the operation. The magneto is set in motion and kept going constantly, and there results a set of alternating impulses of electricity of such tension and quantity as the necessities of the case demand. As long as all the push-buttons are in their normal condition two paths are open to these secondary impulses for each secondary coil—viz., one to each outlying line through the annunciator-bell and the drop-bell and high-resistance rheostat at the distant local station to ground, and the other through R^5 to earth at central station. The latter circuits, being all of comparatively low resistance, take the larger proportion of the current, and hence the bells at the outlying stations do not ring.

It will of course be understood that the bell and annunciator magnets are polarized magnets adapted to be operated by alternating impulses, and that none of the bells at outlying stations or the annunciator drops or bells will be operated unless some person at an outlying station, or the operator at the central station, manipulates the proper push-button.

The mechanism at the outlying stations is in each instance a duplicate of that shown at station No. 1, where R is the rheostat, Sh the shunt, P the push-button shown, to close the shunt about rheostat R, thus offering to the current-impulses a lower path than that through the central-station rheostat and energizing the bell-magnet B' and annunciator bell-magnet B^5, with the drop-magnet in the annunciator-box. I have shown in the drawings the operator at station No. 1 calling central station, while at the same time the central station is calling station No. 4. Annunciator-drops 1 and 4 are down, and the bells at stations 1 and 4, as well as central-station bell, are all ringing. Stations 2 and 3 are idle with the telephones on their hooks. When the telephones are taken off their hooks and the necessary connections made between stations 1 and 4, as disclosed in the prior part of this application, conversation may proceed.

I am aware that it is old, broadly, to repeat messages telephonically from one station to another through the medium of induction-coils so arranged that both subscribers may talk at will, and therefore I make no claim to such a construction.

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

1. In a telephone system, two or more outlying stations having telephone transmitters and receivers electrically connected to a switch or exchange board at a central station, in combination with a transmitting-battery located at or near said switch-board and having one active or zinc electrode for use with each outlying station when connected in working-circuit, and a common positive or carbon electrode for all of said zincs or active electrodes, with switch-plug connections, the whole being so arranged that when all of the subscribers are talking in pairs the whole battery is in use, and when none are talking no battery is in circuit, substantially as described.

2. In a telephone system having two or more outlying subscribers' stations, containing transmitting and receiving instruments connected electrically to a common central switch-station by main lines, each one through the primary of an inductorium, with secondary circuits and connections for connecting any two subscribers together, and a single source of electricity located at the central station and adapted for use in all the outlying lines, substantially as described.

3. In a telephone system, the combination of a generator of electricity adapted to gin

rapidly recurring or alternating impulses of electricity, and located at a central station, with an inductorium, the primary of which is included in the generator-circuit, and which has a series of secondary circuits, and a switch-board, whereby the secondary circuits may be connected at will to outlying circuits running to subscribers' stations, substantially as described.

4. In a telephone system, the combination of a generator of electricity located at the central station and adapted to give rapidly recurring or alternating impulses of electricity in a circuit including the primary of an inductorium, with a series of secondary circuits therefor, one for each outlying subscriber, said secondary circuits being provided with switch-board connections, as shown and described, so that any subscriber may call central office, or central office may call any subscriber, substantially as described.

5. In a telephone system, the combination of a generator of electricity located at the central station, adapted to give rapidly recurring or alternating impulses of electricity said generator being included in the primary circuit of an inductorium, and a series of secondary circuits therefor normally closed in multiple arc through circuit-controllers and a low-resistance circuit at the central station with a series of outlying subscribers' circuits, each including the central office call signal, a call-signal at the local station and a high-resistance rheostat, as well as normally-open shunt about such rheostat whereby calls may be made between the outlying stations and the central office, substantially as described.

ISIDOR KITSÉE.

Witnesses:
JOHN A. WIEDERSHEIM,
JAMES F. KELLY.

Correction in Letters Patent No. 430,960.

It is hereby certified that Letters Patent No. 430,960, granted June 24, 1890, upon the application of Isidor Kitsee, of Cincinnati, Ohio, for an improvement in "Telephone Systems," were erroneously issued to said Kitsee and Jerome Carty and John A. Wiedersheim, of Philadelphia, Pennsylvania, and Charles J. Kintner, of New York, N. Y., as owners of the entire interest in said invention; that said Letters Patent should have been issued to said *Kitsee and Jerome Carty, Alexander McIlwee, jr., and John A. Wiedersheim, of Philadelphia, Pennsylvania, and Charles J. Kintner, of New York, N. Y.*, said McIlwee being one of the assignees of three-fourths interest in said invention as shown by assignments of record in this office; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 5th day of August, A. D. 1890.

[SEAL.]

CYRUS BUSSEY,
Assistant Secretary of the Interior.

ROBERT J. FISHER,
Acting Commissioner of Patents.