

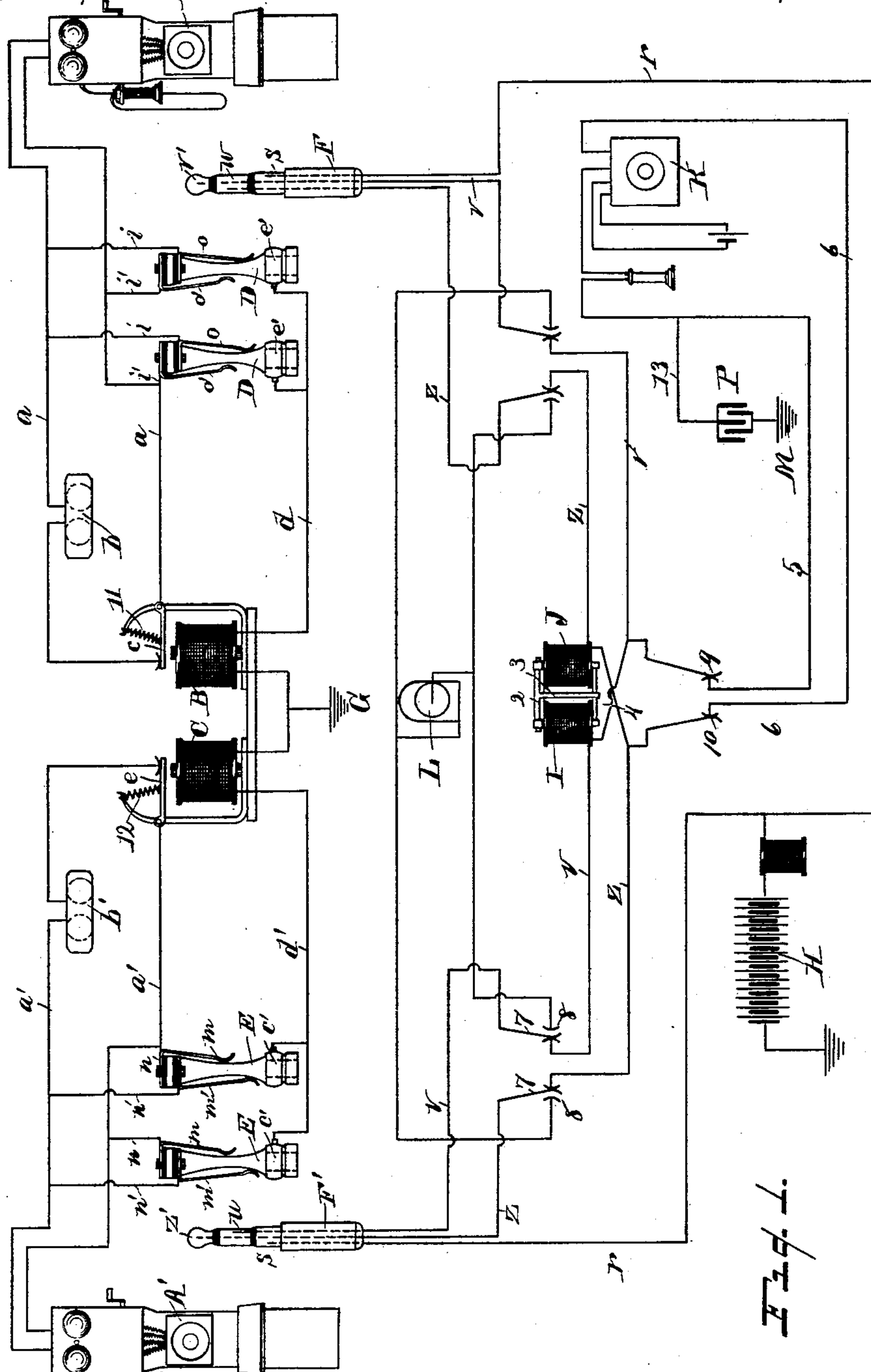
(No Model.)

2 Sheets—Sheet 1.

F. C. HUGHES & G. W. KELLEY.
MULTIPLE SWITCHBOARD SYSTEM.

No. 593,394.

Patented Nov. 9, 1897.



WITNESSES.

B. A. Wheeler
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INVENTORS.
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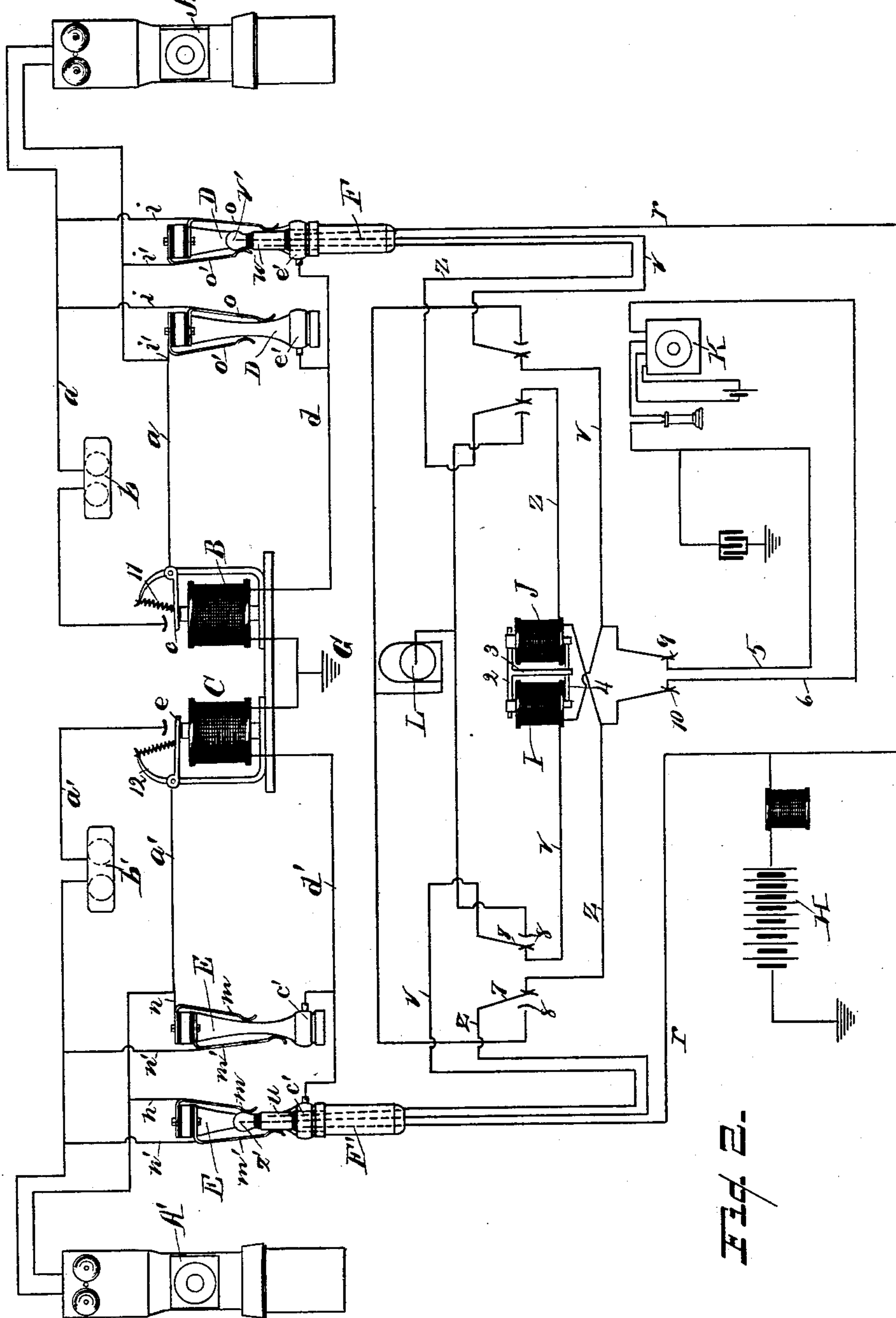
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Fig. 2.

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UNITED STATES PATENT OFFICE.

FRED C. HUGHES AND GEORGE W. KELLEY, OF DETROIT, MICHIGAN; SAID
KELLEY ASSIGNOR TO SAID HUGHES.

MULTIPLE-SWITCHBOARD SYSTEM.

SPECIFICATION forming part of Letters Patent No. 593,394, dated November 9, 1897.

Application filed February 1, 1892. Renewed July 26, 1897. Serial No. 646,038. (No model.)

To all whom it may concern:

Be it known that we, FRED C. HUGHES and GEORGE W. KELLEY, citizens of the United States, residing at Detroit, in the county of Wayne, State of Michigan, have invented certain new and useful Improvements in Multiple-Telephone Systems; and we do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

This invention relates to new and useful improvements in a multiple-telephone system; and it consists in a certain construction and arrangement of parts, as hereinafter fully set forth, the essential features of which being pointed out particularly in the claims.

The objects of the invention are to produce a multiple metallic telephone system in which all ground disturbances are removed from the "talking-circuit" and all line-contacts are eliminated from the switchboard proper and the annunciator-circuit is separated from the talking-circuit and automatically broken when the talking-circuit is established, in which a perfect balance of the line is effected and an infallible "clearing-out drop" provided therefor, and in which provision is made for a reliable and complete test to determine whether or not a line is in service without creating any disturbances on said line, and a further provision whereby any break in the test-line is readily detected. These objects are attained by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a diagram view of our improved system, showing the operator's telephone and such portion of a switchboard and connections as is necessary to illustrate its operation, the parts in said view being in their normal position. Fig. 2 is a view of same, showing position of parts when connection is made between two subscribers.

Referring to the letters and figures of reference, A and A' indicate the subscribers' tele-

phones, each being provided with a line leading to the switchboard and which forms the ringing or annunciator circuit $a a'$ for said instruments, respectively, in which circuits are located the respective "indicating-drops" $b b'$. Located in and forming a part of said annunciator-circuits are the armatures $c e$ of the electromagnets B C, the spools of said magnets being outside of said circuits.

Connected with the line of the instrument A and its annunciator-circuit a through the wires $i i'$ is a series of spring-jacks D, said wires terminating at the jacks in the springs $o o'$, that are insulated from the base of said jacks. In electrical connection with the collars e' of the jacks D is a line d , that is also connected with the winding of the spool B and grounds at G. This line forms a part of an auxiliary circuit that is established when a plug is inserted in one of the jacks D, whereby the magnet B is energized to attract its armature c and break the annunciator-circuit, as hereinafter fully described. The jacks E are in like manner connected with the line of the instrument A' and its annunciator-circuit a' by means of the wires $n n'$, that terminate at said jacks in the springs $m m'$, respectively, the jacks E being connected at their collars c' with the auxiliary line d' , traversing the spool C and also grounding at G. This construction, it will be understood, is common to all subscribers' lines entering the switchboard.

F and F' indicate three-way plugs of the ordinary construction. Connecting the sleeves s of said plugs is a line r , which is supplied electrically by a generator or from a battery H, as shown. Leading from the sleeve u of the plug F' is a line v , in which is located the spool I, and which terminates in the ball v' of the plug F. Leading from the sleeve w of the latter plug is a line z , in which is located the spool J, and which terminates in the ball z' of the plug F', said ball and the sleeves of said plugs being insulated from one another. These lines v and z form a portion of the talking-circuit when the subscribers A A' are connected by the insertion of the plugs F F' in their respective jacks, and by locating one of

the spools I J on each of said lines a perfect balance of the talking line or circuit is effected.

Pivotaly suspended before the poles of the magnets I J is an armature 2, having a projecting arm 3, that engages and retains the clearing-out drop 4 until said magnets are energized by the ring-off of the subscriber, which passes a generator-current through said magnets, when the armature is attracted and said drop falls to indicate that the line is no longer in service, which is well understood.

K indicates the operator's telephone, which is connected with the lines $v z$ through the wires 5 6.

In explanation of the operation of this system a call from A drops the annunciator b . The operator then inserts the plug F in the corresponding jack, as shown at the right of Fig. 2, which places the operator in communication with A through the contact of the springs $o o'$ with the ball v' and sleeve w of said plug and through the lines $v z$ and 5 6. At the same time the plug is inserted in said jack electrical connection is made between the sleeve s of said plug and the collar e' of the jack in which the plug is inserted, whereby a current is established from the battery H through the wires r and d' and magnet B to the ground G, energizing said magnet and attracting the armature c thereof, thereby breaking or cutting out the annunciator-circuit. When the operator ascertains the number called for by A, the plug F' is inserted in the corresponding jack, as shown at the left of Fig. 2, and a contact made between the ball z' and sleeve u of said plug and the springs $m m'$ of the jack, thereby connecting the lines $v z$ with A' and at the same time making a contact between the sleeve s of said plug and the collar c' of said jack and establishing a current from battery H through the lines r and d' and the magnet C to the ground G, energizing said magnet and attracting its armature e to break or cut out the annunciator-circuit a' from the talking-line. After this connection has been made with A' said subscriber is called by the operator depressing a key that makes a contact between the points 7 8 and "cuts in" a current from the generator L on the lines $v z$, leading to the plug F', as is common. When A and A' are in proper communication, the operator's telephone is cut out by breaking the lines 5 6 at the points 9 10, thereby establishing between said subscribers a purely-metallic and perfectly-balanced line or circuit and one in which there are no high resistances that tend to dissipate the electric current.

It is of course understood that the operation will be precisely the same should a call come from A' and the connection be made with A.

When the clearing-out drop 4 is thrown down, to indicate that the line is no longer in

service, the plugs F F' are removed from their respective spring-jacks, thereby "cutting out" the current from the magnets B C, when their armatures will be raised by the springs 11 12, respectively, thus closing or restoring the annunciator-circuits to their normal conditions. By automatically breaking the ringing or annunciator circuit when the plug is inserted in the spring-jack (through the action of the electromagnet) the resistance of the line-drop is removed. In making a test to determine whether or not a line is in service the operator touches the base or collar of the jack corresponding to the number called with the end z' of the plug F', and if there is a current in the test or auxiliary line connected with the base of said jack, which for convenience we will say is line d' , a portion of said current will flow through the plug and on lines z and 6 to the operator's telephone K, thence on line 13 to the ground M, through the condenser P, giving a sufficient sound in the telephone to determine the flow of the current on the line d' . The flowing of the current in line d' indicates to the operator that a connection exists with the number called and the line is in operation, thereby obviating the "plugging in" on a line in service and interrupting a conversation. Should the test or auxiliary line become broken between the jack and the electromagnet in said line, the insertion of a plug in said jack would fail to energize said magnet and break the annunciator-circuit. Therefore when the current from generator K is cut in to ring the subscriber the annunciator will drop, showing an improper connection and indicating a break in the line, which may be readily located. This test is infallible, leaving no doubt as to the efficiency of the line.

Having thus fully set forth our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a telephone system, the combination of the line-circuits having two limbs, one of which contains an annunciator, the spring-jacks connected with said limbs, the electromagnets in circuit with their respective jacks through auxiliary lines, said magnets controlling a circuit-breaker in the respective limbs of the line-circuits, a set of plugs connected by three cords, two of said cords having each a magnetic coil therein that actuate the clearing-out drop, and which form a part of the talking-circuit, the third cord having a battery or source of electricity thereon, said plugs being adapted to be inserted in their respective "jacks" to connect the subscribers, and at the same time energizing the magnets in the auxiliary line, to break the annunciator-circuits, substantially as set forth.

2. In a telephone system, the combination of the line-circuit having two limbs one of which contains an annunciator, the spring-jack connected with said limbs, the electro-

5 magnet in circuit with said jack, said magnet controlling a circuit-breaker in said limbs, a set of plugs connected by cords having a magnetic coil therein that actuates the clearing-out drop and which forms a part of the talking-circuit, a cord having a source of electricity thereon connected with said plugs, which, being inserted in their respective jacks connect the subscribers and at the same time

energize the magnets in the auxiliary line to break the annunciator-circuits.

In testimony whereof we affix our signatures in presence of two witnesses.

FRED C. HUGHES.

GEORGE W. KELLEY.

Witnesses:

E. S. WHEELER,

H. R. WHEELER.