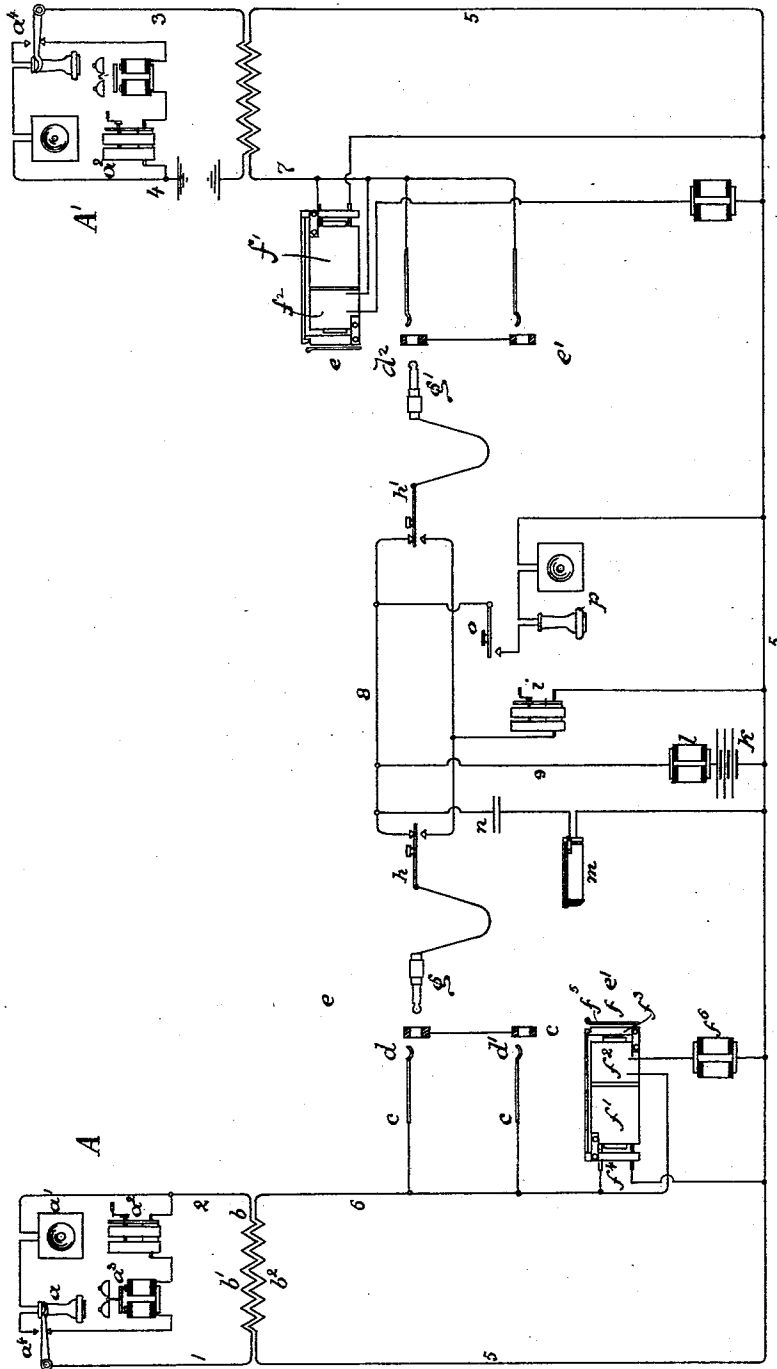


(No Model.)

C. E. SCRIBNER.
TELEPHONE EXCHANGE SYSTEM.

No. 571,910.

Patented Nov. 24, 1896.



Witnesses
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UNITED STATES PATENT OFFICE.

CHARLES E. SCRIBNER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE WESTERN
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TELEPHONE-EXCHANGE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 571,910, dated November 24, 1896.

Application filed October 16, 1894. Serial No. 526,063. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. SCRIBNER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Telephone-Exchange Systems, (Case No. 363,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to switchboards for telephone-exchange systems. Its object is to produce a simplified arrangement of apparatus and circuits for the telephone-switchboard adapted for use with either grounded or metallic circuits or with a "mixed system" comprising both.

Heretofore it has been common in telephone-switchboards to provide each line with an annunciator having a device for automatically resetting the indicator of the annunciator, this device being actuated by current in a local circuit which is arranged to be closed in the establishment of connection with the line. This local circuit has been independent of the line-circuit and has required additional contact-pieces in the spring-jacks of the line. The switchboard system has thus been complicated to a certain extent in order to effect the automatic resetting or restoration of the line-annunciator.

In my present invention I have aimed to provide a switchboard equipped with such a "self-restoring" annunciator, but to eliminate the independent local circuit for controlling the resetting mechanism of the annunciator, this function being performed by circuits involving the main or telephonic connections and without the addition of other apparatus than that required in connection with the telephonic circuits.

In my invention I employ a self-restoring annunciator which is adapted to display its signal when excited by alternating or pulsating currents, but to be reset to its normal position by a constant current through its helix or helices. This annunciator I place in a bridge or branch connection between the different sides of the telephonic circuit. In connection with the plug-circuit for uniting different telephone-lines I arrange a source

of electric current, also in a bridge between the sides of the telephonic circuit, which is therefore connected in parallel with the line-annunciator when connection is established with the line. For signaling in the telephone-line I employ the usual generator of alternating current. It will thus appear that signaling-currents, being of alternating character, will operate the line-annunciator to give the desired signal; but when connection is established with the line in response to the signal a constant current will be set up through the helix or helices of the annunciator by the battery or other source of current in connection with the plug-circuit, and the annunciator will thus be reset and prevented from subsequent operation during the use of the line.

In carrying out my invention I prefer to employ only one line-contact in each spring-jack and a single conductor for the plug-circuit, the return-circuit being through a wire or through an earth connection common to all the plug-circuits of the exchange. The different telephone-lines may not be in direct connection with their corresponding spring-jacks and circuit connections in the switchboard, but may be connected with these through the medium of repeating-coils, whereby disturbances within the switchboard arising from accidental or extraneous currents in the line-circuits will be obviated.

My invention is illustrated in the accompanying drawing, which represents diagrammatically the apparatus and circuit connections involved.

Two substations A and A' are shown connected by means of line-circuits 1 2 and 3 4, respectively, with the telephone-switchboard at the central station. The apparatus at the substation is of the usual character, comprising a telephone *a* and microphone *a'*, a generator *a²* of signaling-current, and a bell *a³*, adapted to respond to such current, and a switch-hook *a⁴*, controlled by the telephone to switch the telephonic or the signaling appliances alternately into circuit with the line. The circuit 1 2 is represented as a complete metallic circuit. The circuit 3 4 is grounded, the conductor 4 being completed through the earth.

At the central station the line-circuit, as, for example, circuit 1 2, includes one helix, b' , of a repeating coil b . One terminal of the remaining helix, b^2 , of the repeating coil is connected with a conductor 5, which is common to all the repeating coils at the central station. Its other terminal is united with a conductor 6. This conductor 6 is connected with the line-springs c of two spring-jacks d and d' , which are assumed to be located upon different sections e and e' of a multiple switchboard. A line-annunciator f , which is located at section e' , is bridged between conductors 5 and 6. This line-annunciator is represented as being of the self-restoring type, having two separate electromagnets f' f^2 , provided with separate armatures f^3 and f^4 , the former of which is adapted to display a signal when it is permitted to fall away from its magnet, and the latter of which acts, when unattracted, to retain armature f^3 in position to conceal its indication through the medium of an arm provided with a catch-engaging armature f^3 . When armature f^4 is attracted, armature or shutter f^3 is released and falls outward, striking a light shield f^5 and throwing it into a horizontal position, whereby the face of armature or shutter f^3 is disclosed. When restoring-magnet f^2 is excited, armature f^3 is retracted and the indication is effaced.

The magnets f' f^2 are included in separate branches between the conductors 5 and 6. The branch containing magnet f^2 includes also an impedance-coil f^6 , making this branch of much higher self-induction than that containing magnet f' . It is obvious that when an alternating current is impressed upon conductors 5 and 6 the greater portion of the current will pass through magnet f' , the passage of the current through magnet f^2 being prevented by the high impedance of the path through it. The annunciator will thus be operated and its signal displayed. When, on the other hand, a constant current finds circuit to conductors 5 and 6, the impedance of the path through magnet f^2 will be of no effect in preventing its passage through the magnet and the latter will be excited and will retract armature f^3 into engagement with the catch controlled by armature f^4 . If desired, the path through magnet f^2 may be of low actual resistance compared with that of magnet f' , in order to accentuate this effect. My invention is not, however, confined to the use of this particular device for causing the annunciator to be operated by alternating currents and to be restored by currents of constant direction, as there are various other well-known forms of annunciator which differ much from this in construction but whose general operation is the same.

Each operator is provided with the usual pairs of connecting-plugs united by flexible conductors for joining different telephone-lines through the medium of their spring-jacks. One pair only of plugs is represented at section e of the multiple switchboard. The

two plugs g and g' are united by a conductor 8, which includes two calling-keys h and h' , each adapted to connect the corresponding plug with one terminal of a signaling-generator i . A battery k or other source of constant current is included in branch conductor 9 from conductor 8 of the plug-circuit, an impedance-coil l being included in the conductor to prevent the escape of telephonic current through the branch. The usual clearing-out annunciator m is included in another branch between conductors 8 and the common conductor 5, together with a condenser n for preventing the flow of continuous current through the annunciator. The operator has also the usual listening-key o for connecting her telephone set p with the plug-circuit.

I will now trace the operation of the system, assuming a call for connection with station A to be originated at station A'. Subscriber at station A' by rotating his calling-generator a^2 , the telephone a being still upon the switch-hook a^1 , transmits an alternating current through circuit 3 4 and through the repeating-coil included therein. A similar current is thus created in the circuit including the other helix of this repeating-coil, that is, through conductor 7, magnet f' , and conductor 5, the alternating current being diverted from magnet f^2 of the annunciator, as before described. The annunciator is thus operated and its signal disclosed to the operator at section e' of the switchboard. This operator then inserts the plug g' into spring-jack d^2 , whereby the circuit of conductor 7 is continued to the plug-circuit and upon the depression of listening-key o through the operator's telephone-set p . The operator is thus enabled to receive the oral order of subscriber at station A' for the desired connection. When the plug g' was inserted in spring-jack d^2 , a circuit for battery k was formed to conductor 7 and a continuous current was created through the magnets f' f^2 of the annunciator. Hence by the excitement of magnet f^2 the annunciator was restored to its normal position and its signal effaced. Having received the order for the desired connection, the operator tests the line called for in the usual way to determine whether it is already in use or not—that is, by applying the tip of the remaining plug g of the pair to the test-thimble c' of the spring-jack d of that line. It will be understood that while the line is not in use this test-thimble would be insulated; but if the line were in use the thimble or test-ring would be connected through the body of the plug with the spring c , and hence with one pole of battery k , by which it would be electrified and would produce a current through the operator's telephone, which would result in a click therein. The sound in the telephone would thus indicate the busy condition of the line tested.

Having found the line to station A free, the operator inserts the plug g into spring-jack d of that line, whereby the telephone-

circuit is continued from conductor 7 to conductor 6 of line to station A, and the two telephone-lines are thus placed in telephonic communication with each other. The operator
5 then signals to substation A by means of the generator *i* of signaling-current, depressing the calling-key *h* for this purpose.

It will be noted that by the insertion of plug *g* into spring-jack *d* the circuit of battery *k* was completed through magnets of annunciator *f* of line A, whereby the operation of this annunciator by any subsequent signaling-currents in the line is prevented.

When the connected subscribers have finished their conversation, either or both may send a signal for disconnection by rotating signaling-generator *a*². The alternating current thus created in the line-circuit produces a similar current in the circuit at the central station, including the conductor 8 of the plug-circuit and the repeating-coils, and the current finds circuit through the clearing-out annunciator *m*, the passage of the alternating current through that branch being unopposed
25 by the condenser. The clearing-out annunciator will thus be operated and the signal for disconnection given to the attendant.

Having thus described my invention and its mode of operation, I claim as new and desire to secure by Letters Patent—

1. The combination with a telephone-line provided with means for transmitting alternating signaling-currents, of a line-annunciator in a bridge therefrom adapted to display
35 its indicator when excited by alternating currents, but to conceal the same when traversed

by continuous currents, a plug for making connection with the line, a clearing-out annunciator adapted to respond to alternating currents, and means for preventing the actuation thereof by continuous currents, said clearing-out annunciator being connected with the plug, a source of continuous current and means for connecting said source of current with the conductor of the telephone-line
45 to find circuit through the line-annunciator when connection is made with the line, substantially as described.

2. In combination, several telephone-lines, each including one helix of a repeating-coil
50 at a central station, local circuits including the remaining helices of the different repeating-coils, said local circuits having one conductor in common, spring-jacks connected with the remaining conductor of each local
55 circuit, and an annunciator adapted to respond to alternating currents but to be reset by continuous currents connected in a bridge between the remaining conductor of the local circuit and the common conductor, a plug-
60 circuit for uniting the spring-jacks of any two local circuits, and a source of constant current in a bridge between the conductor of said plug-circuit and the common conductor, substantially as described.

In witness whereof I hereunto subscribe my name this 13th day of September, A. D. 1894.

CHARLES E. SCRIBNER.

Witnesses:

ELLA EDLER,
LUCILE RUSSELL.