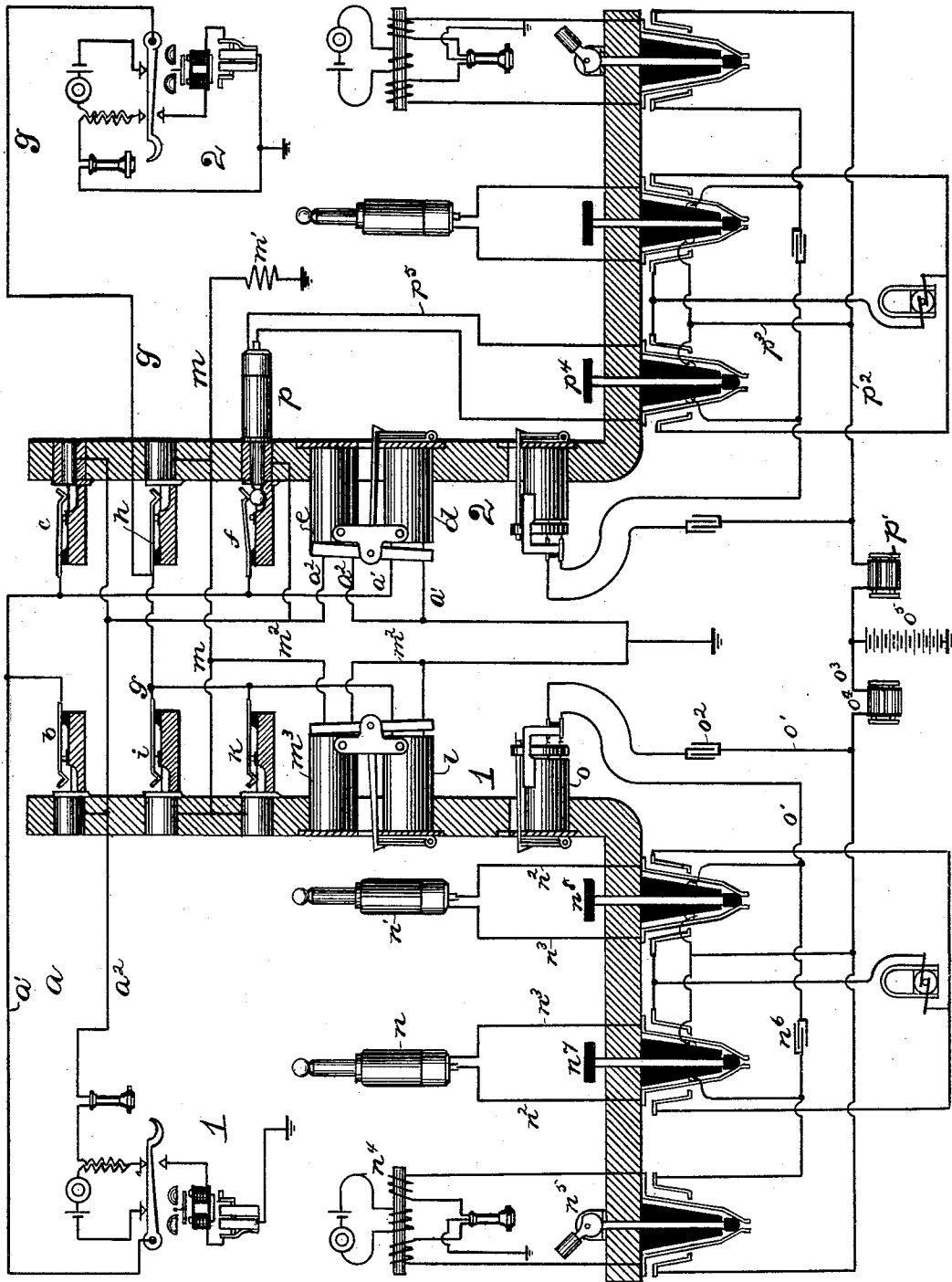


(No Model.)

C. E. SCRIBNER.
TELEPHONE EXCHANGE.

No. 481,679.

Patented Aug. 30, 1892.



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.

SPECIFICATION forming part of Letters Patent No. 481,679, dated August 30, 1892.

Application filed November 16, 1891. Serial No. 411,981. (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 Apparatus, (Case No. 242,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to telephone-exchange apparatus, and more particularly to the operator's outfit at the central office.

My invention has reference to those systems of telephone-exchange in which the branches or limbs of the different lines are connected with the springs of the switch or switches and thence through the individual annunciator.

My invention will be shown in connection with a multiple-switchboard system in which metallic circuits are employed, the telephone-lines being normally grounded at the subscriber's station and permanently grounded at the central office. The individual annunciator of each line is provided with two electro-magnets, the respective coils thereof being in different limbs or branches of the line. These electro-magnets when energized exert opposite pulls upon the common armature, so that when both are energized the annunciator will not be thrown down. When, however, the electro-magnet whose coil is in that limb of the circuit connecting with the springs of the switches is alone excited, the individual annunciator will be operated. In case the electro-magnet in the limb of the telephone-line connecting with the test-rings is alone excited the individual annunciator will not be operated, since the pull or attraction of this electro-magnet is in a direction to prevent the annunciator from being thrown down. Metallic circuits thus connecting with multiple switchboards and with individual annunciators having each two oppositely-acting electro-magnets I have shown and described in my application, Serial No. 397,900, filed June 29, 1891, for multiple-switchboard systems. The electro-magnet of the individual annunciator which is included in the limb connecting with the springs of the

switches I term the "operating" electro-magnet, as distinguished from the other electro-magnet, whose coil is included in the branch or limb of the line connecting with the test-piece of the switches.

Speaking generally, my invention consists in the operator's keyboard circuit and apparatus. One strand of the pair of cords, preferably that connected with the sleeves of the plugs, being provided with a branch circuit through battery to ground, the other strand of the cords, that connecting with the tips of the plugs, being provided with bridge-wires to the other strand, one bridge-wire including the operator's telephone, the other including the clearing-out drop and a condenser.

The operator's telephone has been heretofore commonly connected or bridged between the cords as shown herein. The clearing-out drop has also been connected in another bridge-wire; but no condenser has been used in the bridge-wire including the clearing-out drop. The battery with which the sleeve-strand of the cord is connected should be of, say, fifteen volts, the primary function of this battery being to supply current to the retaining electro-magnet of the individual annunciator of a line with which connection has been made. I therefore have termed the battery a "retaining-battery," although it is adapted to serve also as a test-battery. A test-battery, however, would not require as much electro-motive force, four or five volts being sufficient for testing purposes. The bridge-wire containing the operator's telephone will be ordinarily open while a conversation is going on between two subscribers. The bridge-wire containing the clearing-out annunciator must be closed to signaling-currents sent over the lines from either subscribers' station. These currents being alternating currents, it follows that they will be effective to throw down the clearing-out drop, notwithstanding the condenser, which is included in circuit with the drop. Current from the retaining-battery, however, will not be effective to operate the clearing-out drop, on account of the said condenser, nor can current from the retaining-battery find circuit through the bridge-wire containing this condenser to the tip-strand—that is, the strand

connecting the tips of the plugs—and hence current from the retaining-battery is prevented from flowing through the coil of the operating electro-magnet of the individual annunciator of a line with which either of the pair of plugs has been connected. I preferably place a condenser in the tip-strand of the cord in a well-known way to make the test more certain when my system is applied to multiple switchboards. The retaining-battery may be common to a large number of cords, a sleeve-strand of each cord having a separate branch or "third leg" connection extending from each sleeve-strand to the battery and ground. I preferably include in each of these third-leg connections a retardation-coil, the retardation-coils performing their well-known function of preventing cross-talk as between the different cords and loss of voice-currents to ground, while permitting a flow of current to the cord.

My invention will be more readily understood by reference to the accompanying drawing, which is a diagrammatic illustration of two multiple switchboards, two subscribers' stations connected therewith, and the operator's keyboard apparatus at the different switchboards. It will be seen that the telephone-line a extends from station 1 in two branches or limbs, the limb a' being connected with the spring of the switches b and c of this line on the different boards, and extending thence through the coil of the operating electro-magnet d of the individual annunciator of the line and thence to ground. The other limb a'' of line a extends through the test-pieces of said switches b c , thence through the coil of the retaining electro-magnet e of the said individual annunciator, and thence to ground. The answering-jack f of line a is included in the circuit thereof in the usual way at the second board. Subscribers' station 2 is connected by line g with spring jack-switches h i on the two boards and with the answering-jack k , thence through the operating electro-magnet l of the individual annunciator, and thence to ground. The test-circuit m of this line is connected from the ground at the central office through resistance m' , and thence with the test-pieces of the switches h i k , and is provided with a branch connection m'' , extending through the retaining electro-magnet m''' of the individual annunciator and thence to ground. It will be observed that test-wire m of line g , instead of continuing to the subscriber's station, passes to ground through resistance m' . If test-wire m extended to station 2, the circuit of the line of station 2 would be the same as that of station 1.

I will now describe the operator's outfit at the different switchboards somewhat in detail. Thus, as shown at board 1, the tips of the plugs n n' are connected together by strand n^2 , while the sleeves of these plugs are connected together by strand n^3 . The telephone n^4 is bridged between these cords, and the

cam-lever key n^5 , of usual construction, provided for cutting the telephone out and in, as desired. In the circuit of strand n^2 , between the tips of the plugs, I preferably include a condenser n^6 , and usual ringing keys n^7 n^8 are provided for looping the generator into circuit between the tip and sleeve of the plug, as occasion requires. The clearing-out drop o is included in the bridge-wire o' between the two strands n^2 n^3 of the cords. In this bridge-wire o' , I have placed a condenser o^2 . The third leg or half-connection o^3 extends from the strand n^3 through the retardation-coil o^4 , and thence through battery o^5 to ground. The operator's outfit at the second board is of the same construction. The plug p is shown inserted in answering-jack f . When the plug is thus inserted in the switch of any line, the tip of the plug is connected with the spring of the switch and the sleeve with the testing of the switch. The telephone at station 1 is shown removed from the hook, so that the subscriber may speak to the operator at board 2 when the operator bridges his telephone into circuit. Assuming the telephone at station 1 to be on the hook, the subscriber 1 by turning his generator will send current over limb a' through electro-magnet d of the individual annunciator of line a to notify the operator of board 2 of his call. The operator at board 2 inserts his plug in the answering-jack f of line a , as before described. Current from the battery o^5 will now flow through electro-magnet e by a circuit which may be traced from said battery o^5 through retardation-coil p' , wire p^2 , branch wire p^3 , thence through the calling-key p^4 , thence by the strand p^5 to the sleeve of plug p , thence to the test-piece of switch f , thence to limb a'' , and thence through the coil of electro-magnet e to ground. The annunciator-drop, therefore, cannot be thrown down by any current which may pass through the electro-magnet d of said individual annunciator.

My invention may be used with systems employing only one switchboard, and other forms of individual annunciators may be substituted for the double electro-magnet individual annunciator shown herein.

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

1. The combination, with the individual annunciator provided with two electro-magnets connected in different branches of the subscriber's telephone-line, of the clearing-out drop included with the condenser in a bridge-wire between the strands of the cords, said cords and their terminal plugs, the retardation-coil in the branch leading to the retaining-battery, and said battery, whereby the individual annunciator is prevented from being thrown down when generator-current is sent to line from the subscriber's station, while the clearing-out drop is traversed by such generator-current and operated thereby, substantially as described.

2. The combination, with a battery o^5 , of
branch circuits $o^3 p^2$, each including a retarda-
tion-coil and a set of plugs with double-strand-
ed cords for each branch circuit, and a clear-
5 ing-out annunciator and a condenser in a
bridge-wire between the strand of each set of
cords, substantially as specified.

In witness whereof I hereunto subscribe my
name this 14th day of November, A. D. 1891.

CHARLES E. SCRIBNER.

Witnesses:

GEORGE P. BARTON,
GEORGE L. CRAGG.