

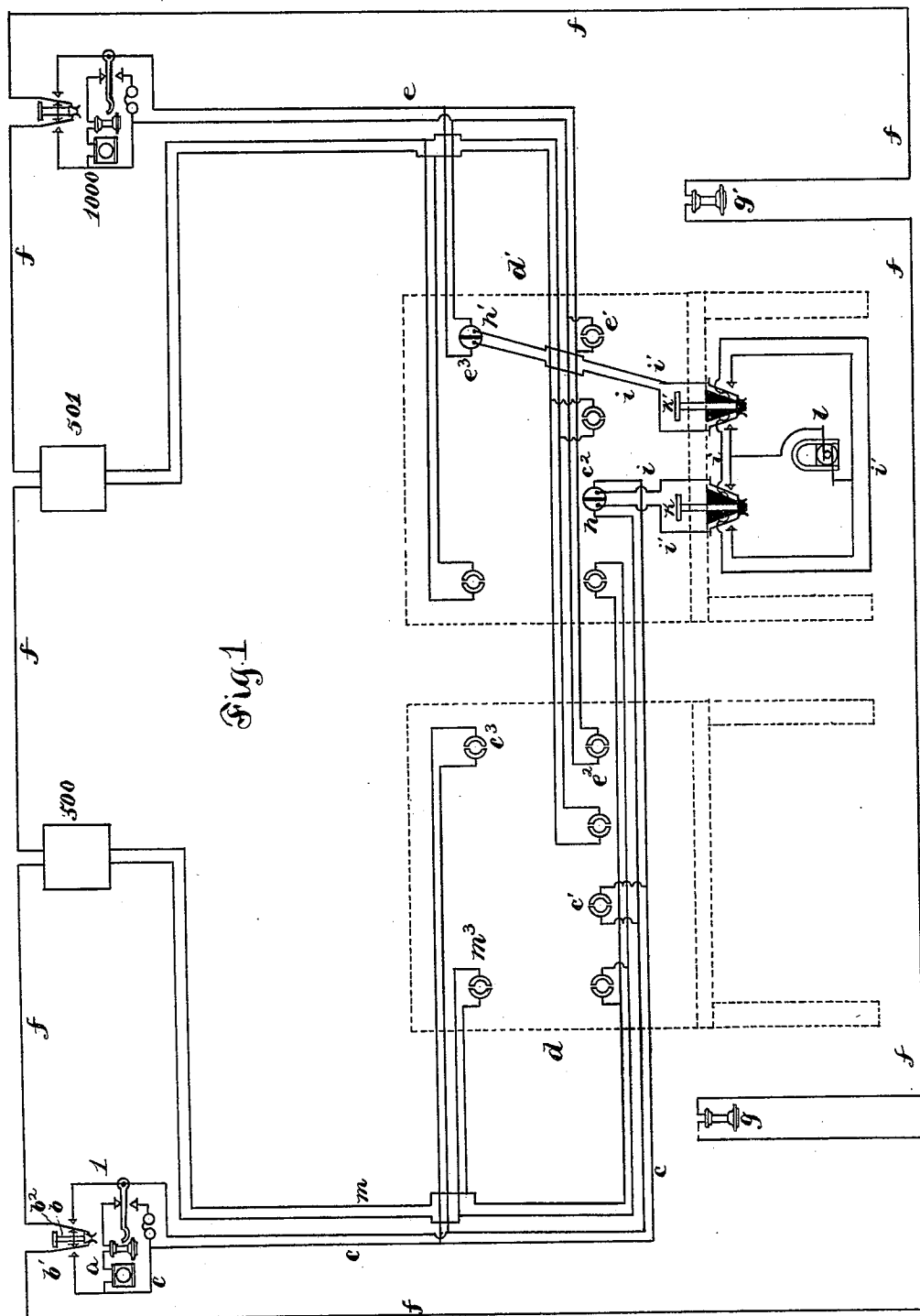
(No Model.)

2 Sheets—Sheet 1.

C. E. SCRIBNER.
TELEPHONE EXCHANGE SYSTEM.

No. 544,388.

Patented Aug. 13, 1895.



Witnesses
George L. Cragg.
W. Clyde Jones.

Inventor
Charles E. Scribner
By Barton Brown Attys

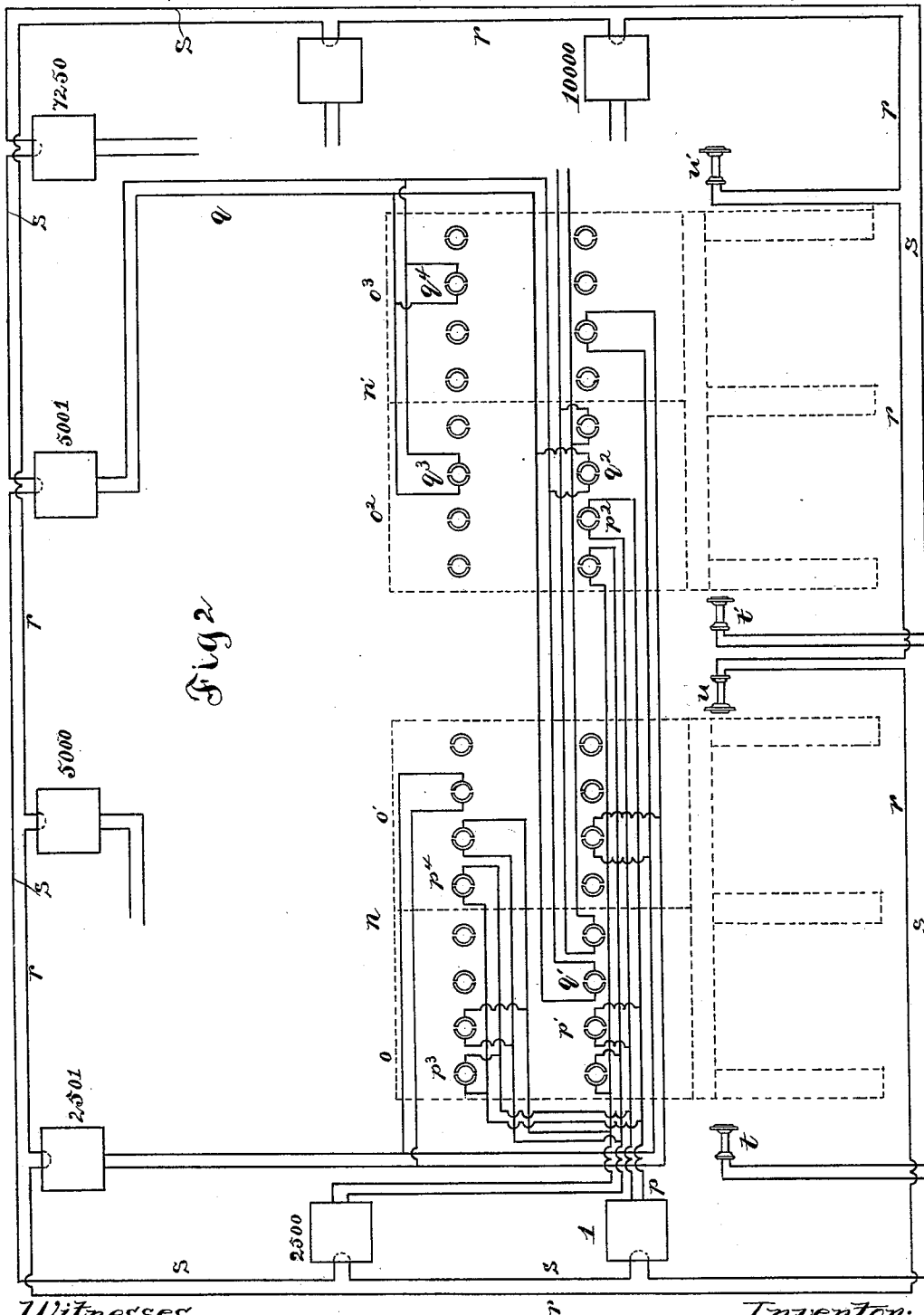
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UNITED STATES PATENT OFFICE.

CHARLES E. SCRIBNER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE WESTERN ELECTRIC COMPANY, OF SAME PLACE.

TELEPHONE-EXCHANGE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 544,388, dated August 13, 1895.

Application filed May 13, 1892. Renewed February 11, 1895. Serial No. 538,043. (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. 305,) 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 switchboard systems for telephone-exchanges. Its object is to simplify the apparatus employed in connecting between telephone-lines at the exchange.

Heretofore in telephone-exchange systems calling-circuits or talking-circuits have been provided including all or a certain portion of the sub-stations of the exchange system and terminating at the exchange in a telephone-receiver at which is stationed a constantly-listening operator; and individual telephone-lines have been extended from each particular sub-station to the exchange, terminating in spring-jack switches upon the different switchboards at the exchange. Thus any subscriber of the exchange is enabled to give an order for a connection to a listening operator at the exchange, and thereupon the operator establishes connection between the calling-line and the line desired by means of connecting-plugs inserted into the terminal spring-jacks of the two lines, respectively. With a large number of sub-stations it has been necessary to provide several calling-circuits, one circuit terminating in a receiver at each of several sections of multiple switchboard, and the subscriber's line-circuit being connected with an answering-jack upon the section of switchboard at which his particular calling-circuit terminated and with a line spring-jack upon every section of the multiple-switchboard system.

In my invention I have divided the different line-circuits into several groups and provided several switchboards, all the members of each group of subscribers' lines being connected with a line-jack upon the particular switchboard belonging to that group and to an answering-jack upon each of the switchboards; and I provide a calling-circuit in-

cluding all of the sub-stations and including a telephone-receiver at each of the different switchboards. Thus any subscriber of the exchange may give an order for a connection over the calling-circuit which will be heard by all of the operators at the different boards, but only the operator at the switchboard which contains the line spring-jack of the line with which connection is desired attends to the order, and she establishes the desired connection. This may be accomplished in the usual way by inserting one loop-plug of a pair into the answering-jack at her board of the calling-line and the other loop-plug into the line-jack of the line called. When the number of subscribers is very great, it may be desirable to provide several calling-circuits. In this case I construct each of the switchboards at the exchange as a multiple-switchboard system, and provide a calling-circuit for each section of one of the multiple switchboards, the different calling-circuits including receivers at corresponding sections of the different multiple switchboards.

My invention is illustrated in the accompanying drawings, Sheets 1 and 2.

In Figure 1, Sheet 1, I have shown four sub-stations of an exchange of one thousand subscribers divided into two groups of five hundred each, the two groups being connected with two switchboards at the exchange. I have shown the apparatus of two of the sub-stations complete, and have shown two of the lines connected at one of the switchboards. In Fig. 2, Sheet 2, I have shown eight sub-stations of an exchange of ten thousand subscribers, the whole number of subscribers being divided into two groups of five thousand subscribers each, the different groups being connected to two different switchboards at the exchange. The switchboards are of the multiple type, each comprising two switching-sections, and two calling-circuits are provided, each of the calling-circuits including a telephone-receiver at one section of each of the switchboards, the two receivers of one circuit being located at corresponding sections of the switchboards.

Referring to Fig. 1, I will describe in detail the apparatus therein depicted. The various telephonic-signaling appliances at the sub-sta-

tion are of the usual character and may comprise a telephone transmitter and receiver *a* and a signal-bell in two different branches from one side of the line-circuit, and an automatic switch adapted to connect the telephone apparatus or the signaling apparatus alternately into the circuit, according to the position of the switch. A loop-key *b* is provided at the sub-station, adapted to loop the telephone apparatus *a* into the circuit connected with its contact-springs *b'* *b*² when the plunger of the key is depressed. The line-circuit *c* extends to the exchange, where it is connected with answering-jacks *c'* and *c*² upon the different switchboards *d* and *d'*, respectively. The line *c* is also connected with a line-jack *c*³ upon the switchboard *d*. Each of the other line-circuits of the group, 1 to 500, inclusive, extends similarly to answering-jacks upon the different switchboards *d* and *d'* and to a line-jack upon the switchboard *d*. Each of the members of the other group, 501 to 1000, inclusive, is connected with answering-jacks upon both switchboards *d* and *d'* and with a line-jack upon the board *d'*. The station 1000, for example, is shown connected by line *e* with answering-jacks *e'* and *e*² upon the boards *d'* and *d* and with the line-jack *e*³ upon the board *d'*.

A calling-circuit *f* includes all of the sub-stations of the exchange, being connected at each of them with the contact-springs *b* and *b'* of a loop-key *b*. The calling-circuit *f* includes at each of the switchboards *d* and *d'* a telephone-receiver *g* and *g'*, respectively, at the two boards. At each of these telephones is stationed a constantly-listening operator. Each of the operators is provided with connecting apparatus—pairs of loop-plugs and connecting-cords—and with calling or signaling apparatus of the well-known character. One cord-circuit at board *d'* is shown complete. It comprises two loop-plugs *h* and *h'*, each having two contact-pieces adapted to make contact with the different line-contacts of the spring-jack into which it may be inserted. The like contact-pieces of the two plugs are connected by conducting-cords *i* and *i'*, respectively. Calling-keys *k* *k'* are included in the cord-circuits, each adapted to disconnect both contact-pieces of one of the loop-plugs from those of the other, and to connect them to the poles of the calling-generator *l*.

When a subscriber of the first group—as, for example, subscriber at station 1—desires a connection with a member of his own group, he depresses the plunger of his key *b*, thus looping his telephone apparatus into the calling-circuit, and gives his order, stating both the number —1— of his line and the number —say 500— of the line with which he desires connection. The order is heard by the operators at both telephones *g* and *g'*; but the operator at telephone *g* at once recognizes that the line called for belongs to the group

having line-terminals at her switchboard *d*. She then inserts one plug of a pair of connecting-plugs into the answering-jack—as *c'*—of the line 1 at her board and the other plug of the pair into the line-jack *m*³ of line 500 at the same board, whereby the sub-stations 1 and 500 are connected into a continuous-loop circuit in the usual manner. She then depresses the plunger of the calling-key, which is connected with the plug in the spring-jack *m*³, sending a calling-current over the line *m* to sub-station 500, where, the switch-hook being in its lowest position, it finds circuit through the signal-bell, calling the attention of the subscriber.

When the subscriber at station 1 desires to communicate with a subscriber of the other group—say line 1000—he sends his order over the calling-circuit *f*, as before, stating to the listening operator that he desires connection from line 1 to line 1000. Both the operators hear the order, as before; but only the operator at board *d'* attends to the order. She proceeds to establish connection between the lines in accordance with the order, as before described. The stations 1 and 1000 are shown thus connected at the switchboard *d'*.

Referring now to Fig. 2, Sheet 2, the sub-stations 1 to 1000, inclusive, are divided into two groups, each including five thousand subscribers, and the members of the different groups are connected to answering-jacks upon both of two switchboards at the exchange and to line-jacks upon a particular one of the switchboards, as before described; but each of the switchboards *n* *n'* is a multiple-switchboard system, comprising switching-sections *o* and *o'* and *o*² and *o*³, respectively, and each of the subscribers' lines is connected with an answering-jack upon one section of each of the switchboards and with a line-jack upon each section of a particular one of the switchboards. Thus the sub-station 1 is connected by line *p* with an answering-jack *p'* upon the section *o* of the board *n* and with another answering-jack *p*² upon the corresponding section *o*² of the switchboard *n'*. The line *p* is also connected with two line-jacks *p*³ and *p*⁴—one upon each of the sections *o* and *o'* of the switchboard *n*. The sub-station 5001 of the other group is similarly connected by a line *q* with an answering-jack *q'* upon the section *o* of the switchboard *n* and with another answering-jack *q*² upon the corresponding section *o*² of the switchboard *n'*, and with two line-jacks *q*³ and *q*⁴, one upon each section of the switchboard *n'*. Two calling-circuits *r* and *s* are provided, each including one-half of the members of each group of sub-stations and each including a telephone-receiver at one section of each of the switchboards. Thus the calling-circuit *s* extends to the sub-stations 1, 2500, 5001, and 7,250, and includes one telephone-receiver *t* at the switchboard *n* near the section *o*, whereon the particular answering-jacks of lines 1, 2500, 5001, and 7250 are lo-

cated, and another telephone-receiver t' at the switchboard n' near the section o' , containing the corresponding answering-jacks at that switchboard. The other calling-circuit r includes similar telephone-receivers u and u' at the sections o' and o'' of the switchboards n and n' , respectively.

The subscriber, for example, at station 1 desiring communication with another subscriber—for example, subscriber at station 5000—gives his order, as before, and it is heard by the operators at all the sections of switchboards o and o'' whereon the answering-jacks of his line are located; but only that listening operator stationed at the particular switchboard n whereon the line-jack of line 5000 is located attends to the order. She establishes connection between the lines 1 and 5000 at the section o of the board n , as before. If the subscriber at station 1 desired a connection with a member of the other group—say 5001—he would give his order for the connection 1 to 5001, as before; but the operator listening at telephone t' at the board n' would have received the order and made the connection.

When a subscriber at a station between 2501 and 5000 desires a connection, he gives his order over the calling-circuit r , which is connected with his sub-station, and the order is received by one of the operators at another section of the switchboards and is attended to as before.

It will be obvious that the system thus described may be indefinitely extended. The sub-stations may be divided into any desired number of groups, and each switchboard may comprise any desired number of sections, and hence any number of calling-circuits.

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

1. The combination with line circuits extending from each of several substations to an exchange, of several switch boards at the exchange, an answering jack for each line provided upon each of the boards, a line jack for each line provided upon some one of the boards, a calling circuit extending to all of the substations, and an electro-magnetic receiving device at each of said boards included in said calling circuit, the several electro-magnetic receiving devices being adapted to simultaneously respond to calling currents from the substations, substantially as described.

2. The combination with line circuits extending from each of several substations to an exchange, of several switch boards at the exchange, an answering jack for each line provided upon each of the boards, a line jack for each line provided upon some one of the boards, a calling circuit extending to all of the substations, an electro-magnetic receiving device at each of said boards included in said calling circuit, and means at each of the substations for signaling over the calling circuit

to the exchange to simultaneously actuate all of said receiving devices, substantially as described.

3. The combination with line circuits extending from each of several substations to an exchange, of several switch boards at the exchange, an answering jack for each line provided upon each of the boards, a line jack for each line provided upon some one of the boards, a calling circuit extending from the exchange to each of the substations, a telephone receiver at each of the boards included in said calling circuit, and means for including the telephone apparatus at the substation in the calling circuit, substantially as described.

4. The combination with line circuits extending from several substations to an exchange, of multiple switch boards at the exchange, each switch board comprising two or more sections, an answering jack for each line at one section of each of the multiple switch boards, a line jack for each line at each section of one of the multiple switch boards, calling circuits each extending to a different group of substations, and including an electro-magnetic receiving device at that section of each switch board whereon are the answering jacks of the particular substations with which it is connected, the several receiving devices being adapted to simultaneously respond to calling currents from the substations, substantially as described.

5. The combination with line circuits extending from several substations to an exchange, of multiple switch boards at the exchange, each switch board comprising two or more sections, an answering jack for each line at one section of each of the multiple switch boards, a line jack for each line at each section of one of the multiple switch boards, connecting apparatus adapted to connect any line spring jack with any answering jack, different calling circuits extending from different groups of substations, and each including a telephone receiver at each section of the switch board whereon are the answering jacks of the particular substation with which it is connected, and means at each substation for including the telephone apparatus thereat in the calling circuit, substantially as described.

6. The combination with line circuits extending from each of several substations to an exchange, of several switch boards at the exchange, a spring jack for each line provided upon each of the boards, a calling circuit extending to each of the substations, an electro-magnetic receiving device at each of said boards, said receiving devices being included in said calling circuit and adapted to simultaneously respond to calling currents sent from any substation, substantially as described.

7. The combination with line circuits extending from each of several substations to

an exchange, of several switchboards at the
exchange, a springjack for a different line
upon each of the switchboards, a calling cir-
cuit extending to all of the substations, an
5 electro-magnetic receiving device at each of
said boards included in said calling circuit,
and means at each of the substations for sig-
naling over the calling circuit to the exchange,

to simultaneously actuate all of said receiv-
ing devices, substantially as described. 10

In witness whereof I hereunto subscribe my
name this 28th day of March, A. D. 1892.

CHARLES E. SCRIBNER.

Witnesses:

FRANK R. MCBERTY,
DE LANCEY A. CAMERON.