

(No Model.)

2 Sheets—Sheet 1.

J. E. KEELYN & K. B. MILLER
TELEPHONE EXCHANGE SYSTEM.

No. 579,299.

Patented Mar. 23, 1897.

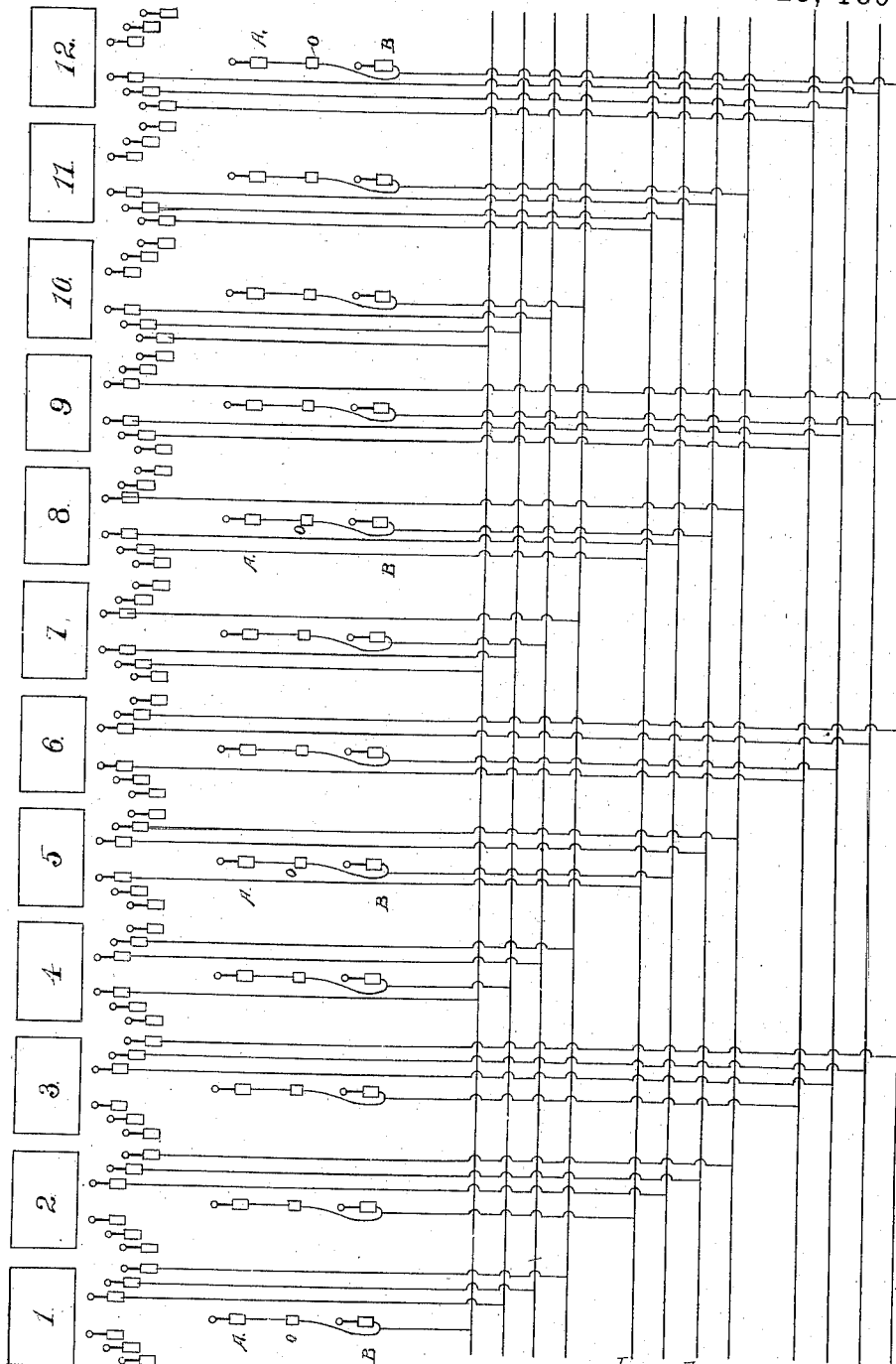


Fig. 1.

Witnesses.
W. K. Mackrille
M. J. Kennedy

Inventors

James E. Keelyn and
Kempster B. Miller.

BY Kempster B. Miller.
ATTORNEY.

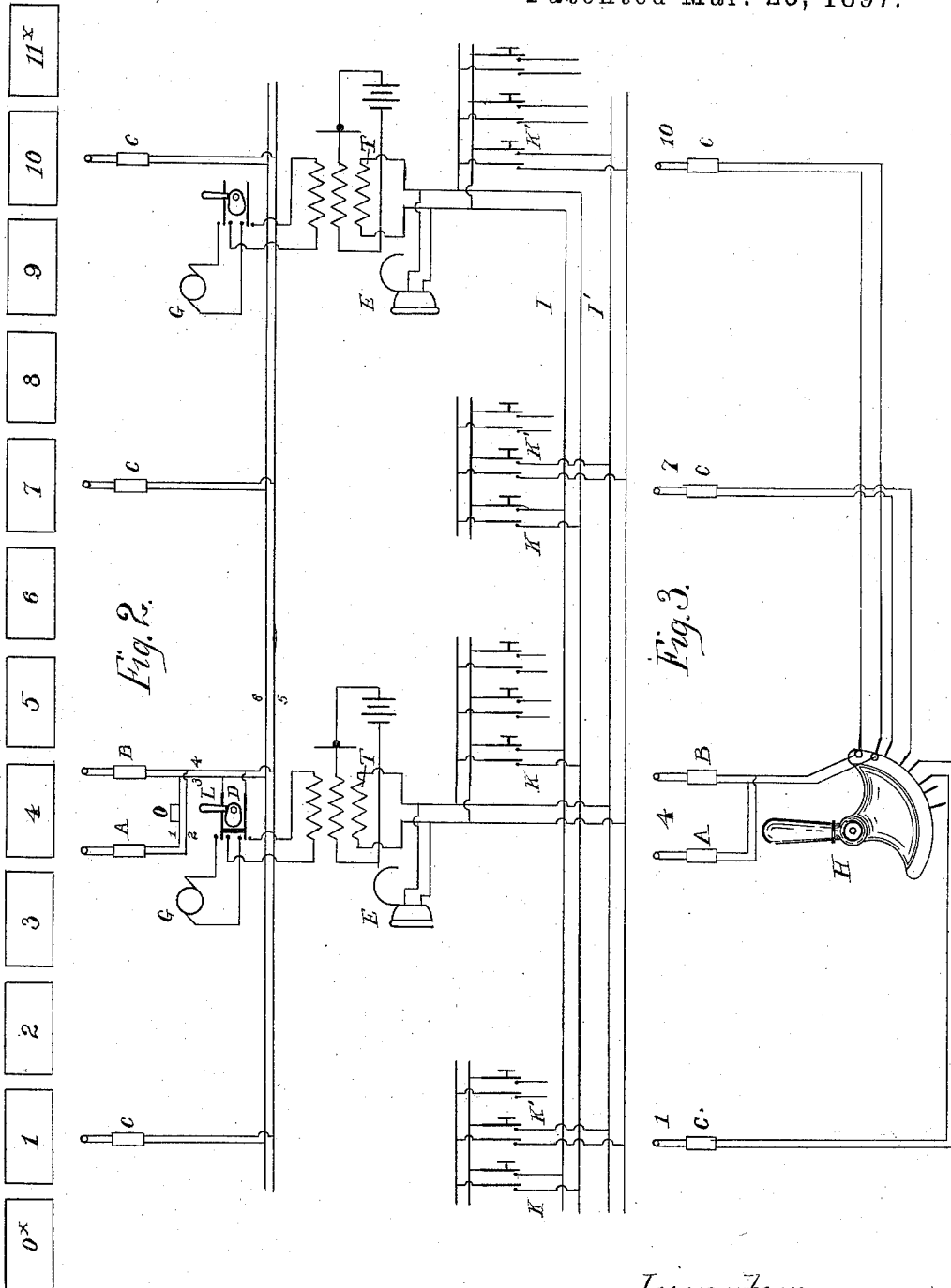
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James E. Keelyn
Kempster B. Miller.
BY *Kempster B. Miller*
ATTORNEY.

UNITED STATES PATENT OFFICE.

JAMES E. KEELYN, OF CHICAGO, ILLINOIS, AND KEMPSTER B. MILLER, OF WASHINGTON, DISTRICT OF COLUMBIA.

TELEPHONE-EXCHANGE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 579,299, dated March 23, 1897.

Application filed April 27, 1896. Serial No. 589,231. (No model.)

To all whom it may concern:

Be it known that we, JAMES E. KEELYN, of Chicago, Illinois, and KEMPSTER B. MILLER, of Washington, District of Columbia, citizens of the United States, have invented new and useful Improvements in Telephone-Exchange Systems, of which the following is a specification.

Our invention relates to divided-board telephone-exchange systems wherein the connection of two subscribers on different boards is effected by trunk-lines interconnecting the boards instead of by the now common multiple-jack arrangement, and has for its object a construction of less complexity than those in use at present, and which will, nevertheless, give quicker and more reliable service. This object is attained by a new arrangement of trunking-circuits, and also by a peculiar and novel method of grouping the operators and their respective boards into overlapping districts, whereby confusion on the trunking and instruction circuits between the operators is largely avoided.

We terminate the subscribers' lines in groups of, say, one hundred each, each group occupying a separate board. These boards are numbered from 1 up and are divided into what we term "districts." The boards of the first district are Nos. 1 4 7 10 13, &c.; those of the second district are 2 5 8 11 14, &c.; those of the third district are 3 6 9 12 15, &c. The boards are of such size and so arranged that an operator sitting at any one of them can easily reach the spring-jacks on her own board and also those on the adjoining boards at her right and left. It is thus seen that every operator, with the exception of the operators at each of the end boards, can reach one board in each of the three districts. For instance, the operator at board 3 has in front of her a board belonging to district 3, at her left a board belonging to district 2, and at her right a board belonging to district 1. At each board are arranged pairs of plugs, each pair consisting of a calling and an answering plug connected together by a cord-circuit, with the usual arrangement for switching in the calling-generator or the operator's telephone set. Connected also to each of these pairs of plugs are branch cir-

cuits or trunk-lines leading to transfer-plugs, one at each board of that district to which a particular pair of plugs belongs. The connection of these trunk-lines to their respective pairs of plugs may be permanent or temporary.

When a call is received at one board, the operator at that board inserts any disengaged answering-plug in the jack of the calling-subscriber, and having determined the subscriber wanted, either makes the connection herself with her corresponding calling-plug, if the subscriber's line terminates on her own or an adjacent board, or she instructs the operator at that board in her own district which is nearest to the board on which the called subscriber's line terminates to insert the transfer-plug of the corresponding trunk-line into the jack of the called subscriber. The two subscribers are thus connected for conversation, and as the connection on this particular trunk-line can be originated at only one board this line cannot be used again by operators at other boards for making other connections.

A separate instruction-circuit is provided for each operator, and into this circuit any other operator belonging to the same district can at will switch her own telephone. By this means each operator can communicate with any of the other operators belonging to her own district, but with no others.

For detailed description of our invention reference must be had to the annexed drawings, which form a part of this specification, and in which—

Figure 1 is a diagrammatic representation of the general scheme of trunk-line arrangement in a system comprising twelve boards. Fig. 2 shows the arrangement of the plugs of one trunk-line with respect to the boards on the first district, and also a separate instruction-circuit between the operators. Fig. 3 refers to a slightly-modified form of our invention.

Reference being had to Fig. 1, 1 2 3, &c., are the divided boards in which the subscribers' lines terminate. As before stated, the boards are divided into preferably three districts. The first district begins with board No. 1 and includes every third board therefrom. Likewise the second and third districts

begin, respectively, with boards Nos. 2 and 3, and each includes every third board from the one on which it begins.

A A A are initiatory answering-plugs at each of the boards.

B B B are the calling-plugs which are used only in case the called subscriber's jack is within reach of the operator at whose board the call originated.

As will be seen in Fig. 2, plugs A B of each pair are connected by a cord-circuit 1 2, containing the clearing-out drop O. Connected to the two sides of this cord-circuit are the branch wires 3 4, leading, respectively, to the two sides of the trunk-line 5 6. Connected in multiple to this trunk-line are the transfer-plugs C C C, distributed at all the other boards of the district to which this particular pair of plugs A B belongs. In like manner, each board is provided with several pairs of plugs A B, each pair being connected with transfer-plugs C C C, distributed at all the boards of that district to which their particular originating pair A B belongs. This is shown in one case only in Fig. 2, where the plugs A B on board 4 are connected by the trunk-line 5 6 with the plugs C C C at boards 1 7 10, &c. One complete set of trunk-lines is shown in Fig. 1, where an initiating pair A B is shown at every board, the pair at each board being connected by a trunk-line with the transfer-plugs C C on every other board of the district to which that board belongs.

It will be noticed that the operators at each of the end boards have boards of only two districts within their reach. For instance, the operator at board 1 can reach only boards 1 and 2, and unless provision is made she will therefore have no transfer-plugs in district 3 within her reach. This is readily provided for by placing a blank board 0^x at the left of board 1 and another blank board 11^x at the right of the board at the other end. Each of these blank boards is provided with transfer-plugs from the board belonging to the district to which they belong in exactly the same manner as the other boards. Thus the blank board 0^x at the left of board 1 would belong to district 3 and would be provided with transfer-plugs from other boards of that district. In like manner blank board 11^x at the right of board 10 would belong to district 2 and would likewise be provided with transfer-plugs from other boards of that district. These blank boards need have no spring-jacks, annunciators, answering-plugs, or operators' sets, as they are provided simply to afford room for the transfer-plugs for the boards of the district to which they belong.

It is obvious that the blank boards 0^x and 11^x could be dispensed with by placing the boards in a circle or in any other closed figure, so that the two end boards would be adjacent and the operator at each could therefore reach the transfer-plugs on boards at both her right and left.

By means of the cam D and the lever L the

generator G or the operator's telephone set E may be connected in any well-known manner across the cord-circuit of any initiating pair A B.

The particular form of circuit-changing switch shown is here illustrated for simplicity only. It will be understood that it is desirable in practice for this device to include means whereby the generator can be thrown into the circuit with either the answering-plug A or in the circuit containing the calling and transfer plugs in multiple. Many of the circuit-changers now in practical use would answer this purpose, and we have not deemed it advisable to show any one of them in detail. Each operator is also provided with a separate instruction-circuit I I', &c., which leads from her telephone set E to a button K K', &c., at each of the other boards belonging to her own district only. By pressing one of these buttons K K' any operator may connect her telephone set E with one of the instruction-circuits I I', leading to any operator in her own district. As shown in Fig. 2, the operators at either of boards 1, 4, or 7 by pressing one of their respective buttons K K K would connect their telephone sets across the circuit I, thus being able to communicate with the operator at board 10 by means of her tertiary coil T. Likewise the operators at boards 1, 7, and 10 by pressing one of their respective buttons K' K' K' may connect their telephones across the circuit I', thus being able to communicate with the operator at board 4.

Only two instruction-circuits are shown complete to avoid confusion, but it is to be understood that other and separate instruction-circuits lead from the several operators to the telephone sets of operators 1 and 7 in a like manner. Both of the other districts are provided with a similar system of instruction-circuits, the systems of each district being entirely distinct.

The operation of our system is as follows: Suppose a subscriber at board 4 calls. The operator at that board inserts any disengaged answering-plug A into the corresponding jack and moves the lever L into a position to connect her telephone set E with the line of the calling-subscriber and ascertains the number desired. If the subscriber called for is at her own board or at either of the adjacent boards 3 or 5, she completes the connection herself by inserting the corresponding calling-plug B of that pair into the jack of the called subscriber. The lever L is then operated to throw the generator-current on the line, thus signaling the called subscriber, when the connection is complete. If, however, the subscriber called for is at, say, board 8, the operator at board 4, after having inserted the plug A into the calling-subscriber's jack, presses the button K of the instruction-circuit leading to operator 7 and tells her to place the plug C of that particular trunk-line into the jack of the called subscriber at board 8. The operator at board 7 then grasps the plug C with the

right hand and reaches over on board 8 to make the desired connection. If the called subscriber were on board 9, the operator at board 4 would communicate with the operator of board 10, who would then make the desired connection with her left hand. Should the calling subscriber be at some board in district 2 or 3, for instance in boards 5 or 6, then the initial connection would be made by operators at board 5 or 6, respectively, who would instruct some operator in their own respective district to make the final connection.

In the modification shown in Fig. 3 the separate calling-plugs at boards 1 7 10 are connected to the initiating pair A and B at board 4 by separate trunk-lines, instead of being connected in multiple to one trunk-line, as is shown in Figs. 1 and 2. In this case a circuit-changer H is needed in order to connect any particular trunk-line with the initiating pair A B.

Suppose a call originated on board 4 which required a connection on one of the three boards within the reach of operator No. 7. The operator at board 4, by means of the circuit-changer H, would connect the trunk-line leading to board 7 with her pair A B, and operator at board 7 would complete the connection by means of the corresponding plug C. Having described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a telephone-exchange system divided boards, an answering and a calling plug connected by a cord-circuit at one of said boards, a trunk-line for interconnecting said boards, and transfer-plugs at one or more other boards, said cord-circuit and transfer-plugs being connected in multiple with said trunk-line, substantially as described.

2. In a telephone-exchange system divided boards, an answering and a calling plug connected by a cord-circuit at one of said boards, a switching device whereby an operator's telephone or a transfer-generator may be connected to said cord-circuit, transfer-plugs at one or more other boards, and a trunk-line for interconnecting said boards, said cord-circuit and calling-plugs being connected in multiple with said trunk-line, whereby a connection can be originated on said trunk-line at one board only, substantially as described.

3. In a telephone-exchange system, divided boards grouped into overlapping districts, a connecting-plug at each board, a trunk-line for each district for interconnecting said boards, the plugs of one district being connected to the trunk-line belonging to that district only, the arrangement being such that a connection on a particular trunk-line may be originated only on a board of the district to which that trunk-line belongs, while the connection may be completed on a board of any district, substantially as described.

4. In a telephone-exchange system, divided boards grouped into overlapping districts, an answering and a calling plug connected by a cord-circuit at each board, transfer-plugs at each board, and trunk-lines for each district connecting the cord-circuit at one board with one of said transfer-plugs at every other board of the same district only, substantially as described.

5. In a telephone-exchange system, divided boards grouped into separate overlapping districts, each district beginning on a certain board and including every third board therefrom throughout the system, a calling and an answering plug connected by a cord-circuit at each board, transfer-plugs also at each board, and trunk-lines for interconnecting said boards, each of said trunk-lines leading from the said cord-circuit to one or more of said transfer-plugs at boards of the same district only, substantially as described.

6. In a telephone-exchange system, divided boards grouped into overlapping districts, trunk-lines for interconnecting said boards, operators' telephones one at each board, each connected to a separate instruction-circuit, and means whereby any operator's telephone of a certain district may be looped into the instruction-circuit of any board belonging to that district only, so that an operator can communicate with the operators in her own district only, substantially as described.

7. In a telephone-exchange system, divided boards grouped into overlapping districts, an answering and a calling plug connected by a cord-circuit at each board, transfer-plugs at each board, trunk-lines for each district connecting the cord-circuit at one board with one of said transfer-plugs at every other board of the same district only; an operator's telephone at each board each connected to a separate instruction-circuit, and means whereby any operator's telephone of a certain district may be looped into the instruction-circuit of any board belonging to that district only; whereby a connection originating on any board must be completed by an operator of the same district only, but may be so completed on a board of any district, substantially as described.

8. In a telephone-exchange system, divided boards and subscribers' line-terminals thereon, an answering and a calling plug connected by a cord-circuit at one of said boards, transfer-plugs at one or more other boards, circuits leading from said cord-circuit to each of said transfer-plugs, and means whereby any one of said circuits may be connected to said cord-circuit, substantially as described.

JAMES E. KEELY.
KEMPSTER B. MILLER.

Witnesses:

F. L. STEVENS,
WILLIAM A. BISLAND.