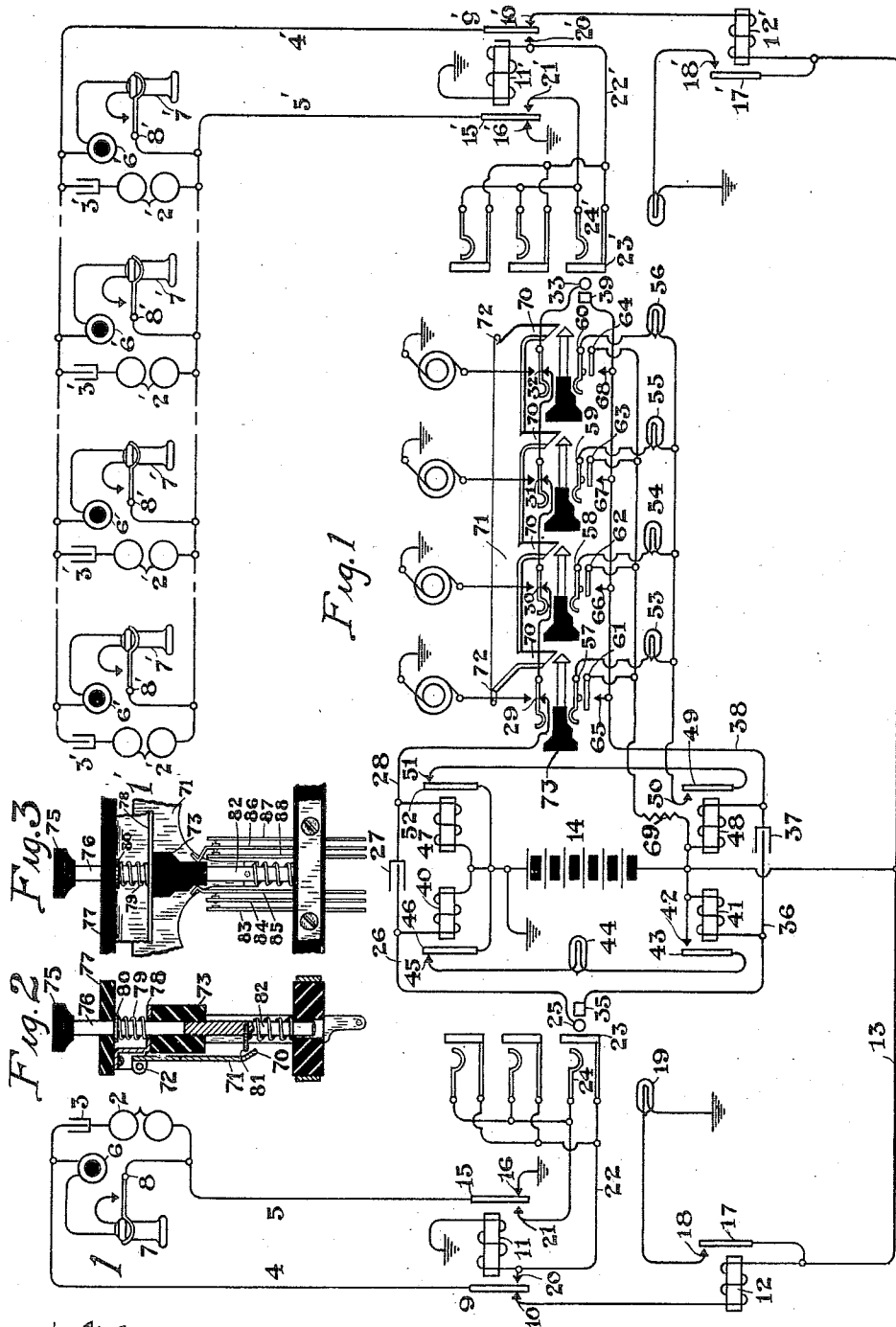


C. C. BRADBURY.
 PARTY LINE INDICATING SYSTEM.
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Witnesses
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UNITED STATES PATENT OFFICE.

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PARTY-LINE-INDICATING SYSTEM.

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To all whom it may concern:

Be it known that I, CLIFFORD C. BRADBURY, a citizen of the United States, residing in Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Party-Line-Indicating Systems, of which the following is a specification.

My invention relates to party line telephone systems, and particularly to the supervisory apparatus for systems of this class. In systems having a plurality of subscribers' stations located on a single line it is desirable to provide means at the central office whereby the operator will know without retaining it in her memory which of the parties upon the party line was last called. For example, if the party called does not respond to the first call and the calling subscriber requests the operator to ring the party a second time it is desirable to have some means at the central office that the operator may know which party on the line has been last called so that she will not have to inquire the number of the calling subscriber a second time. For this purpose various kinds of indicating keys have been devised having pointers, targets and other means to indicate the last key depressed. It has been found that lamp signals are the most effective for telephone switchboards and it is the object of the present invention to provide lamp signals to indicate to the operator which party has been last called. It has been common practice to provide cord circuits with answering and calling supervisory lamps and by my present invention I provide the calling end of the cord circuit with four such lamps, these lamps to perform the usual function of the supervisory lamps but to be individually displayed according to which of the several substations upon the party line is called.

My invention is illustrated in the accompanying drawing in which—

Figure 1 represents the system, Fig. 2 is a sectional end view of the ringing key, and Fig. 3 is a portion of the elevation of the key.

In Fig. 1 in which all parts are shown in

their normal or unactuated condition two lines are illustrated, the calling line being that at the left of the drawing. This line has the substation 1 equipped with the usual annunciator 2 and condenser 3 in a permanent bridge between the line conductors 4 and 5 and with the transmitter 6 and receiver 7 in a bridge maintained normally open by contacts of the switch hook 8.

The battery 14 is shown with its positive pole grounded. For convenience in the drawings, I have shown ground connections at the cut-off relays 11 and line lamps 19, but it is, of course, understood that these connections would be made to the grounded or positive pole of the battery 14 by the common return and therefore all circuits at the exchange would be metallic. In the following description wherever a ground connection is referred to, it will, of course, be understood that a connection to the grounded or positive pole of battery is meant.

At the central office line conductor 4 is connected through contacts 9 and 10 of cut-off relay 11 and the coil of line relay 12 and conductor 13 with the live pole of battery 14, and line conductor 5 is connected through contacts 15 and 16 of cut-off relay 11 with earth. Line relay 12 has the normally open contacts 17 and 18 in the circuit of the line lamp 19. Cut-off relay 11 has also the inside contacts 20 and 21, contact 20 being connected through the coil of the cut-off relay with earth and through conductor 22 with the sleeve or test contacts 23 of the answering and multiple jacks, and contact 21 is connected with the tip contacts 24 of the answering and multiple jacks. The called telephone line is similarly equipped, it having four subscriber's stations instead of one. The apparatus of this line corresponds to that of the calling line and the like apparatus is designated by like figures with the suffix "'".

In the system herein described the annunciators of the four party line stations are shown connected in a bridge between the line conductors, these annunciators being preferably of the harmonic type though it is to be understood that any other form of se-

lective or non-selective signals may be used without departing from the spirit or scope of my invention.

The cord circuit to connect the calling and 5 called lines for conversation has the tip strand extending from the tip 25 of the calling plug through conductor 26, condenser 27, conductor 28 and the series contacts 29, 30, 31 and 32 of the operator's ringing key 10 to the tip 33 of the calling plug. The sleeve strand similarly extends from the sleeve contact 35 of the answering plug through the conductor 36, condenser 37 and conductor 38 to the sleeve contact 39 of the 15 calling plug. The cord circuit here shown is of the well known four relay type, the tip and sleeve answering relays 40 and 41 being connected in a bridge between the tip and sleeve conductors, this bridge including 20 the main battery 14. Sleeve relay 41 controls normally open contacts 42 and 43 in the circuit of the supervisory lamp 44, the normally closed contacts 45 and 46 of relay 40 also being in the circuit of this lamp. 25 The calling end of the cord circuit is similarly provided with the tip and sleeve relay 47 and 48, these relays and the battery 14 being connected in a bridge between the tip and sleeve conductors 28 and 38. The 30 relay 48 controls normally open contacts 49 and 50, contact 49 being connected through contacts 51 and 52 of relay 47 with earth, and the contact 50 being connected with one terminal of each of the supervisory lamps 35 53, 54, 55 and 56. The other terminals of each of these supervisory lamps are connected respectively to the spring contacts 57, 58, 59 and 60 of the operator's ringing key. These contacts are adapted to connect with 40 the contacts 61, 62, 63 and 64 respectively upon the actuation of the respective ringing keys, and these latter contacts are connected together and the group is connected with the live pole of battery through the non-inductive resistance 69. These contacts 61, 62, 45 63 and 64 are adapted to connect with the contacts 65, 66, 67 and 68, these latter contacts being each connected with the sleeve conductor 38 of the talking circuit.

50 By the construction of the actuating knob of the ringing keys, when the key is fully depressed the contacts upon the lower side of the key are all three connected together but when the key is released it returns only 55 far enough to release the outside contacts leaving the two inside contacts in connection, the key plunger being caught in its intermediate position by the projections 70 upon the pivoted plate 71, this plate being 60 adapted to be rocked upon its pivots 72 by the actuation of any one of the four ringing keys so that it will release any one of the keys previously depressed to its intermediate position.

It is to be understood that some of the apparatus such as the listening key and operator's set are omitted from the drawing for the sake of clearness, but that these, which form no part of my invention, may be of any of the well known forms. 70

The key shown in Fig. 1 is to be understood as being diagrammatically shown. A mechanical embodiment of this key is shown in Figs. 2 and 3 in which like reference numbers are used to designate the mechanical 75 parts having the same function as the conventionalized parts shown in Fig. 1. This key has the buttons 75 attached to the vertical plungers 76, these plungers extending downwardly through the top plate 77. Below the top plate is the angular shelf 78 80 which forms a seat for the spring 79, this spring being adapted to press against the collar 80 to normally hold the plunger in its uppermost position. The spring actuating 85 button 73 has an opening in the top thereof large enough to receive the lower end of the plunger 76, this plunger being loosely fitted into the spring actuating block 73. The plate 71 extends along the side of the key 90 and is pivoted at the point 72. This plate has the catch portion 70 adapted to engage the pin 81 when the key plunger is depressed. The pin 81 is carried by the plunger 82, this plunger being entirely separate 95 from the plunger 76 and being adapted to be held in its depressed position by the engagement of the catch 70 upon the pin 81. However, when the plunger 82 is retained in this position the plunger 76 is free to return to 100 its normal position. Contact springs are here shown which are adapted to operate similarly to the contact springs of the conventional key. It will be seen that when the button 75 is completely depressed the 105 springs 83, 84 and 85 will all be in electrical connection and that springs 86 and 87 will be connected while spring 88 will now be disconnected. When the button 75 is released it will return to its normal position but the 100 spring actuating member 73 will be retained in a partially depressed position such that the springs 84 and 85 will be in contact but the spring 83 will be disconnected. In this position, however, the springs 86 and 88 are 115 again connected and the spring 87 is left disconnected.

While the mechanical embodiment of my invention is here shown and described it is to be understood that I do not wish to be 120 unduly limited thereto, it being possible to vary the arrangement of the mechanical parts of this key without departing from the spirit or scope of my invention.

In the operation of my system the calling 125 subscriber removes his receiver from the switch hook and completes a circuit from the live pole of battery 14 through con-

ductor 13, the coil of relay 12, contacts 10
 and 9 of cut-off relay 11, line conductor 4,
 transmitter 6, receiver 7, switch hook 8, line
 conductor 5 and contacts 15 and 16 of cut-
 off relay 11 to ground. The current in this
 path actuates line relay 12 closing its con-
 tacts 17 and 18 and displaying the line lamp
 19. The operator, upon observing the sig-
 nal 19, inserts her answering plug into the
 answering jack causing the tip contacts 25
 and 24 and the sleeve contacts 35 and 23 of
 the plug and jack to register. A circuit is
 thus completed from the live pole of battery
 14 through the coil of supervisory relay 41,
 sleeve contacts 35 and 23 of the plug and
 jack, conductor 22 and the coil of cut-off
 relay 11 to ground. Current in this path
 actuates relays 11 and 41. The actuation of
 relay 11 disconnects the line relay and
 effaces the line lamp. The actuation of re-
 lay 41 closes the circuit of the supervisory
 signal 44. This signal, however, is not dis-
 played because immediately upon the actua-
 tion of cut-off relay 11 a new path for cur-
 rent is completed from the negative pole of
 battery 14 through the coil of supervisory
 relay 41, sleeve contacts 35 and 23 of the
 plug and jack, conductor 22, the now closed
 contacts 20 and 9 of cut-off relay 11, line
 conductor 4, transmitter 6, receiver 7, switch
 hook 8, line conductor 5, contacts 15 and 21
 of the cut-off relay 11, contacts 24 and 25
 of the jack and plug and the coil of super-
 visory relay 40 to positive pole of battery
 14. The operator now receives the desired
 number by means of her operator's set which
 is not shown in the drawing and inserts the
 calling plug into the jack of the desired
 line. Thereupon a circuit is completed from
 the live pole of battery 14 through the coil
 of supervisory relay 48, conductor 38, sleeve
 contacts 39 and 23' of the plug and jack,
 conductor 22' and the coil of cut-off relay
 11' to ground. Current in this path actu-
 ates relays 48 and 11', the actuation of relay
 11' moving its contacts to their abnormal
 positions and connecting the line conductors
 4' and 5' directly with the sleeve and tip
 contacts of the jack. The actuation of relay
 48 closes its contacts 49 and 50. The oper-
 ator now depresses the ringing key adapted
 to connect the desired selective ringing cur-
 rent upon the line to call the desired sub-
 scriber. Suppose this key to be the one
 designated by 73, this key will be fully de-
 pressed causing the tip spring to connect
 with the generator contact and causing the
 contacts 57, 61 and 65 to be connected to-
 gether. The generator current will there-
 fore flow through the series contacts 30, 31
 and 32 of the other keys, through the tip
 contacts 33 and 24' of the plug and jack,
 contacts 21' and 15' of the cut-off relay 11',
 over line conductor 5', through condensers
 3' and annunciators 2', at all of the sub-
 scribers' stations on the line, conductor 4',
 contacts 9' and 20' of the cut-off relay 11',
 the sleeve contacts 23' and 39 of the jack
 and plug, contacts 65 and 61 of the ringing
 key 73 and through the non-inductive re-
 sistance 69 and the battery 14 back to the
 ground pole of the ringing generator. The
 current in this path being of a definite fre-
 quency actuates the annunciator of only one
 of the four subscribers' stations. The ring-
 ing key is then released and returns to
 an intermediate position or that position in
 which it will be held by the projection 70
 upon the pivoted plate 71. When held in
 this position the contact 65 is disconnected
 but the contacts 57 and 61 remain in con-
 nection. The circuit of the supervisory
 lamp 53 is therefore completed from the
 live pole of battery 14 through the non-
 inductive resistance 69, contacts 61 and 57
 of the ringing key, the signal 53, contacts
 50 and 49 of supervisory relay 48 and
 contacts 51 and 52 of supervisory relay 47
 to positive pole of battery 14. This displays
 the signal 53 and indicates to the operator
 that the called subscriber has not yet an-
 swered his call. If the called subscriber
 does not respond to the first signal the op-
 erator depresses her key 73 a second time,
 being informed which key was last de-
 pressed by the display of the signal 53.
 When the party answers his call a circuit is
 completed through the transmitter and re-
 ceiver of the answering station, line con-
 ductor 5', contacts 15' and 21' of the cut-off
 relay 11', tip contacts 24' and 33 of the jack
 and plug, the series contacts 32, 31, 30 and
 29 of the ringing keys, conductor 28 and
 the coil of supervisory relay 47 to positive
 pole of battery 14. Current in this path
 actuates relay 47, separating its contacts 51
 and 52 and effacing the supervisory signal
 53. When the subscribers terminate their
 conversation and again replace their re-
 ceivers upon their respective hooks the cir-
 cuit is again severed through the super-
 visory relays 40 and 47, causing these relays
 to resume their normal positions, which again
 completes the circuit of supervisory signals
 44 and 53, notifying the operator that the
 conversation has been terminated. The op-
 erator then removes her answering and call-
 ing plugs from their respective jacks and
 severs the circuits of relays 41 and 48 which
 again sever the circuits of the supervisory
 signals 44 and 53. The apparatus is now in
 its normal condition and may be used for
 a second call. The contacts 51 and 52 are
 included in the circuits of any one of the
 signals 53, 54, 55 or 56 which is displayed
 and therefore the signal displayed acts not
 only as an indicating signal but also as a
 calling supervisory signal. If any other

key is depressed the plate 71 will be rocked on its pivots 72 and will release the key 73 and allow the contacts 57 and 61 to return to normal.

5 It is to be understood that the signals 53, 54, 55 and 56 may be placed either in the key itself in the position usually occupied by the supervisory signals or that these signals may be placed in association with each of the key
10 buttons, or in any other position found desirable and that many other detail changes may be made without in any way departing from the spirit or scope of my invention.

I claim:

15 1. In a telephone system, the combination with a party line, of a cord circuit to connect with said line, a plurality of supervisory signals for the cord circuit adapted to be individually displayed according to the substa-
20 tion on the party line which is called, substantially as described.

2. In a telephone system, the combination with a telephone line having a plurality of substations thereon, a cord circuit to connect
25 with the telephone line having a plurality of supervisory signals, one for each of the substations on the line, and means whereby the signals will be individually displayed to indicate which of the subscribers on the line
30 has been called, substantially as described.

3. In a telephone system, the combination with a telephone line having a plurality of substations thereon, a cord circuit to connect
35 with the line for conversation, a plurality of supervisory signals for the calling end of the cord circuit, means for individually displaying said signals to indicate which of the parties upon the line has been called, and
40 means to efface the signal when the called party answers his call, substantially as described.

4. In a telephone system, the combination with a telephone line having a plurality of substations thereon, of a cord circuit to connect
45 therewith, an operator's ringing key, a plurality of lamp signals and means to indicate by the display of said signals the station last called, substantially as described.

5. In a telephone system, the combination with a telephone line having a plurality of substations thereon, an operator's ringing
50 key having a plurality of actuating means, a plurality of electrically operated signals for the cord circuit respectively individual to each of said actuating means and adapted to
55 be individually displayed to indicate which of said actuating means was last operated and released, substantially as described.

6. In a telephone system, the combination with a telephone line having a plurality of
60 subscribers' stations thereon, of a cord circuit to connect therewith, a ringing key having a plurality of actuating plungers, lamp signals, one associated with each of said

plungers, and means to indicate the last
65 plunger depressed by the condition of said lamps, substantially as described.

7. In a telephone system, the combination with a telephone line having a plurality of
70 subscriber's stations thereon, of a cord circuit to connect with the line, supervisory signals for the cord circuit, one corresponding to each of the subscribers' stations on the line, and means to selectively control
75 said supervisory signals to indicate which of the parties on the telephone line has been called, substantially as described.

8. In a telephone system, the combination with a cord circuit, of a ringing key for said
80 cord circuit, a plurality of actuating means for said ringing key, a plurality of signals, one for each of said actuating means, means depending upon the insertion of the calling
85 plug to place a signal in condition to be operated when any of said actuating means is depressed, and means to prevent the operation of any of the other signals during the
operation of the first signal, substantially as described.

9. In a telephone system, the combination
90 with a cord circuit, of a ringing key therefor, series contacts of said ringing key in one strand of said cord circuit, normally disconnected parallel contacts of said key
95 connected with the other strand of the cord circuit, normally disconnected parallel contacts of said key connected with the source of direct current and adapted to be connected
100 with one strand of the cord circuit during ringing, and normally disconnected contacts adapted after ringing to be connected with the normally open contact of the key which is connected with the source, and signals connected with said latter
105 contacts and adapted to be displayed by current from said source only when the latter contact is connected with the contact which connects with the source, and means to hold the last means actuated in a position to
110 maintain the circuit through the latter two contacts, substantially as described.

10. In a telephone system, the combination with a cord circuit, of a plurality of
115 ringing keys therefor, and a plurality of lamp signals adapted to be displayed to indicate the last key actuated, substantially as described.

11. In a telephone system, the combination with a cord circuit, of a plurality of
120 ringing keys, and a plurality of electrically operated signals to indicate the last key depressed, substantially as described.

12. In a telephone system, the combination with a cord circuit, of a plurality of
125 signals therefor, said signals serving both as supervisory and party line indicating signals, substantially as described.

13. In a telephone system, the combina-

tion with a ringing key having a plurality of actuating means, of a plurality of electrically operated signals to indicate the last means actuated and released, substantially
5 as described.

14. In a telephone system, the combination with a ringing key, a plurality of actuating means, of electrically operated means for indicating the last key depressed and
10 released, substantially as described.

15. In a telephone system, the combination with an operator's ringing key having

a plurality of vertically reciprocating plungers, of electrically operated means to indicate the last plunger depressed, substantially
15 as described.

Signed by me at Chicago, county of Cook, and State of Illinois, in the presence of two witnesses.

CLIFFORD C. BRADBURY.

Witnesses:

MARJORIE E. GRIER,
EDITH F. GRIER.