HARMONIC SELECTIVE TELEPHONE SYSTEM.

To all whom it may concern:

Be it known that I, ARTHUR F. POOLE, citizen of the United States, residing at Wheeling, in the county of Ohio and State of West Virginia, have invented a certain new and useful Improvement in Harmonic Selective Telephone Systems, 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 party line selective telephone systems, its object being to provide simplified and improved selective means for enabling the selection of one party of a plurality of parties connected to a single telephone line.

For carrying out my invention, I employ harmonic selective devices at the substations adapted to respond to alternating currents of certain frequencies or characteristics, these devices being connected to control a circuit through the signal bells at the substations, and at the central exchange means for sending alternating current or currents of certain frequencies into the line to cause actuation of the selective devices to set up current conditions for the bells at the substations to render one of the bells operative and the others inoperative, so that when ringing current from another source is simultaneously sent into the line, only the selected bell will ring. The selective devices for all the substations are identical, each having a plurality of contact sets, and the number of selective current generators at the central exchange is equal to the number of contact sets for each device. The contact sets of each device cooperate to control the circuit through the corresponding signal bell. Depending upon the combination of currents sent into the line from the central exchange, the contacts at the various substations cooperate when the selective devices are actuated to adjust the signal bell circuits to render one of the bells operative and to prevent operation of the others.

Broadly, the main feature of my invention resides in the use of harmonic selective currents in combinations, and in the use of selective devices at the substations responsive to such combination of selective current to control the signal bell circuits. With this arrangement I am enabled to select from a far greater number of parties from a given number of frequencies over a single circuit than is possible in harmonic systems now in use in which the number of frequencies required is the same as the number of stations to be selected. T. is, of course, not only reduces the number of generators required at the central office but also the number of keys.

In the accompanying drawings I have illustrated my invention, and Figure 1 diagrammatically illustrates a telephone party line system showing the harmonic selective apparatus at the substations and circuit controlling apparatus at the central exchange; Fig. 2 is a top view of one of the harmonic selective devices which I may employ for the purpose of my invention; Fig. 3 is a side elevation of the selective device; Fig. 4 is an end view thereof, and Fig. 5 is a sectional view showing the relation of the contact springs to the armatures of the selective devices. Fig. 6 illustrates diagrammatically a modification involving eight subscribers' stations connected on a single line and the means for selectively signaling these stations in accordance with my invention.

The form of selective device shown is only one of the many which could be used for carrying out my invention, and is shown as comprising the cores 1 and 2 connected by the yoke 3 and terminating respectively in pole blocks or shoes 4 and 5 having between them the air gap 6. On the cores 1 and 2 are mounted the energizing coils 7 and 8 respectively. An L-shaped polarizing bar 9 is secured at one end to the middle of the yoke 3, its other end being opposite the air gap 6 between the pole shoes, and from this end are supported the armatures 10 and 11 which extend into the air gap 6 normally midway between the pole faces. Ribs or springs 12 and 13 respectively connect the armatures 10 and 11 with the head 14 to which they are secured by means of the plate 15 and screws 16, this head extending 100 through the bar 9 and secured thereto by the nut 17. These armatures are tuned to be responsive to alternating current flow through the coils of certain frequencies, and the armatures, therefore, may themselves be of different mass or weight, or weights 18.
may be provided for the armature 10 and 
adjustably mounted on the threaded rod 19 
extending therefrom, and weights 20 may be 
provided for the armature 11 and adjustably 
mounted on the threaded stem 21 extending 
therefrom. These weights, as shown, are 
doubled so that they may mutually lock 
each other to the threaded stems when the 
proper adjustment or tuning has been ac-
complished. Supported on the bar 9 below 
the armatures is an insulating mounting 
block 22 from which extend a set of contact 
springs 23a, 24a and a set of contact springs 
25a, 26a, the contact springs of each set being 
normally in contact at their upper ends at 
which platinum contact points 27 and 28 
respectively are provided. Abutment posts 
or washers 29, 30 are inclosed between the 
contact springs 23a, 24a and the upper arma-
ture 10 and may be carried by the armature 
or by the springs as shown. Similar abut-
ment posts or washers 31 and 32 are inter-
posed between the contact springs 25a and 
26a and the lower armature and may be sup-
ported from the springs, as shown, these 
washers or posts being all of insulating 
material to insulate the springs from the 
armatures. A rod 33 of insulating material 
is secured at one end to the upper end of the 
bar 9, and the other end is secured to the 
non-magnetic bridge piece 34 spanning the 
pole shoes, and this bar is disposed between 
the ends of the contact springs of the sets 
so that when an armature is vibrated, the 
35 springs of the corresponding set will be 
repeatedly disconnected from each other,— 
that is, when the armature moves in one 
direction, one spring will be moved therethrough, 
but the other spring will be stopped 
40 by the insulating bar 33, and thus contact 
between the springs broken, and in the same 
manner when the armature moves in the 
opposite direction, the other spring will be 
moved therewith and the first spring held 
by the insulating bar. Thus, when current 
of a certain frequency flows through the 
energizing coil, the upper armature will be 
vibrated to repeatedly disconnect the springs 
in the corresponding set, while, if a current 
of a different certain frequency flows 
through the energizing coil, the lower arma-
ture will be vibrated to repeatedly open the 
Springs of the corresponding set. Both 
armatures, it will be noticed are controlled 
by the same set of energizing coils and in-
stead of only two armatures being thus con-
trolled, as shown, any number may be con-
trolled by the same energizing coils upon 
current flow of different frequencies ther-
60 through to which the various armatures are 
tuned.

In Fig. 1 I have shown the line limbs x, y 
of a telephone line leading from a central 
exchange E to the substations 1, 2, 3 and 4. At the central exchange are shown the 65 
spring contacts 35 and 36 connected with the 
line limbs, and the contact 37 is normally 
in engagement with the spring 35, and the 
limb y normally connects through these con-
tacts and the indicator 38 with one pole of 
the common central battery 39, the line limb 
when the switchhook is raised, and the receiver is included in a local circuit 
including the secondary winding 52. At 
substation 1, the lower terminal of the sig-
bell winding 44 connects with the con-
tact 25a normally engaging the contact 26a 
which connects with the contact 23a nor-
mally connected with the conductor 47. 
The other winding 45 of the signal bell is not 
utilized in this arrangement. At 
substation 2 the terminal winding 44 connects 
both with contacts 25b and 23b, while the 
terminal of the winding 45 connects only 
with contact 24a while contact 26c connects 
with conductor 47, the upper terminals of 
the windings 44 and 45 being connected to 
gether and with contact 42, the same as at 
substation 1. At substation 3 the lower 
terminal of the signal bell winding 44 connects 
both with contacts 26d and 23d, while the 
lower terminal of winding 45 connects with 
contact 25c and contact 24d connects with 
conductor 47. At substation 4 the lower 
terminal of winding 44 connects with con-
tact 26e and with conductor 47. The lower 
terminal of winding 45 connects with con-
tacts 25e and 23e. At the central station is 
shown the cord circuit C terminating in the 
answering plug 53 and calling plug 54, and 
includes an operator's listening key 55 and 
selective keys 56, 57 and 58. Upon de-
pression of the operator's key 55, the oper-
ar's telephonic apparatus 0 will be con-
ected in bridge of the cord circuit in a well
known manner. A ringing generator \( G \) either directly or through a transformer 59 connects with the alternate contact 60 of key 58 and with contact 61 normally engaging spring 62 of key 57. The generator \( G \) may be any ordinary ringing generator of alternating currents such as is commonly used in telephone exchanges for ringing bells on single subscribers' lines. Spring 62 connects with contact 63 normally engaging spring 64 of key 56 which spring connects with alternate contact 65 of key 55. Thus when key 55 is depressed, current flows from generator \( G \) directly to the tip strand and serially through the selective key contacts to the sleeve strand of the calling plug. Between the normal contact 63 and alternate contact 65 of key 56 is connected a selective current generator 66 either directly or through a transformer 67. Between normal contact 61 and alternate contact 63 of key 57 is connected a selective generator 68 either directly or through a transformer 70. The generators 66 and 69 deliver currents of different character. In the preferred embodiment of my invention herein shown the generator 66 delivers an alternating current of one frequency, this frequency being such as to affect the \( a \) contacts when flowing through the selective energizing windings. The generator 68 delivers an alternating current of a different frequency and such that it will affect the \( b \) contacts when flowing through the selective energizing windings. These frequencies are such that current from the generator 66 will not affect the \( b \) contacts nor will current from the generator 68 affect the \( a \) contacts. The frequencies of the currents delivered by the selective generators are different from that delivered by the straight generator \( G \). The alternating current delivered by the generator \( G \) will not, therefore, affect the contacts \( a \) or \( b \) which are tuned to respond to currents of the frequencies delivered by the special generators 66 and 68. A supervisory indicator 71 may be connected between the battery and the cord circuit, as shown, for connecting the line limb \( y \) with battery when the connection through indicator 38 is broken upon insertion of the calling plug into the spring jack.

The operation of the system can now be readily understood, and for convenience I shall refer to keys 56, 57 and 58 as the \( a \), \( b \) and \( g \) keys respectively; generators 66, 68 and \( G \) I shall refer to as the \( a \), \( b \) and \( g \) generators respectively; and the contact sets 23, 24 and 25, 26 I shall refer to as the \( a \) and \( b \) contacts. The spring jack at the right of the drawing is intended for connection with another line which it is not necessary to show here, it being supposed that a call comes in over this line, and in response thereto the operator has inserted the plug 53 into the spring jack to ascertain the connection desired and that connection with the subscriber at substation 1 was desired. In response thereto, the operator inserted the calling plug 54 into the spring 70 jack connected with the line limbs \( x \), \( y \), leading to substation 1 and other party substations connected with the line. The adjustment is such that the signal bell at substation 1 will respond only when the key 58 at the central exchange is actuated to send only straight ringing current over the line from generator \( G \). As described, the winding 44 of the signal bell at this substation is normally connected serially in circuit with the various contacts, controlled by the selective energizing winding 7, but as the selective device will not respond to ordinary ringing current but only to the selective current from \( a \) or \( b \) generator, the \( a \) and \( b \) contacts will not be opened and consequently the circuit through the signal bell winding will not be opened, the result being that current from the \( g \) generator may flow through the signal bell to cause operation thereof. On the other hand, the signal bells at the other substations 2, 3, and 4 will not be affected. Neither will the selective devices at the other substations be affected. The contacts at these substations, therefore, will not be open, but at substation 2, the windings 44 and 45 of the signal bell are connected in parallel and in opposition, the current flowing from line limb 4 through the hook switch contact 42 and condenser 49, part thereof passing through winding 44 to the common point 72, the remaining current flowing through winding 45 through the 4 \( a \) contacts to the common point 72 which point connects through the 105 \( b \) contacts and conductor 47 with line limb 49 and, therefore, this signal bell will not respond. At substation 3, part of the current from limb 4 flows through winding 44 to the common point 72 and the remainder flows through winding 45 through the \( b \) contacts to the common point 72 which point connects through the \( a \) contacts and conductor 47 with line limb 49. At substation 4 part of the current flows through winding 44 to the common point 72 and the remainder flows through winding 45 and through both contact sets \( b \) and \( a \) to the common point 72 and conductor 47 to line limb 49, and the signal bell windings at the substation 2, 3 and 4 being in opposition, as before stated, the bells do not respond. Suppose now that connection had been desired with substation 2. The operator then depresses both the \( g \) key and one of the 125 selective keys to simultaneously send current from the \( g \) generator and from the selective generator. Consider that the cur-

rent from the a generator is of such frequency as to affect the a contacts when flowing through the selective energizing windings and that current from the b generator affects the b contacts. The selective keys may be constructed to be locked when depressed in order to indicate what station is being selected. After the a key is depressed, the operator activates the g key until the called subscriber answers. At substation 1 then, the current flow from the a generator through the selective winding 7 causes the a contacts to be opened, thereby preventing current flow from generator G through the signal bells which, therefore, do not respond. It might be stated here that the rapidity of vibration of the tuned armatures is sufficiently great so that, although in reality the contact springs of a set are rapidly opened and closed, the effect will be as though they were held open continually during vibration of the armature. At substation 2, however, the signal bell will respond as the selective device will respond to the current from the a generator to activate the lower armature to open the a contacts, thereby opening the path through the winding 45 of the signal bell. Current from generator G then flows through line limb a through the winding 44 and through the b contacts to line limb y, the signal bell then sounding. At substation 3 the a contacts control both circuits through the signal bell windings, and upon being opened there will be no current flow through the signal bell. At substation 4, opening of the a contacts will have no effect on the signal bell, as the path through the b contacts remains closed and current from generator G flows through both windings 44, 45 of the signal bell, but as these windings are in opposition, there will be no response of the signal bell. Thus, when the a and g keys are both depressed, the signal bell at substation 2 only will be effective. If it had been desired to call substation 3, the operator would simultaneously actuate the b and g keys so that current from the b and g generators will flow simultaneously over the line. At substation 1, the signal bell will not ring because the b contacts are opened upon current flow through the selective device winding f from the b generator. At substation 3, the b contacts control both paths through the signal bell windings and when opened, there can be no current flow through the signal bell windings from generator G and consequently no response. At substation 3, the b contacts upon being opened, will disconnect winding 45 from circuit, leaving in winding 44 which will cause response of the signal bell. At substation 4, opening of the b contacts has no effect on the signal bell windings on account of the parallel circuit through the a contacts, and on account of the opposed relation of the windings, current flow therethrough will not cause response of the bell. If substation 4 was desired, the operator would simultaneously actuate the a, b and g keys so that current from the generator G and from both selective generators will flow simultaneously over the line. The currents from the a and b generators will cause operation at all the substations of the selective apparatus thereat to open both contact sets. At substation 1 this prevents current flow through the signal bells which do not respond. At substations 2 and 3 there will also be no current flow through the signal bell windings, but at substation 4 the parallel circuits controlling current flow through the winding 45 will both be opened and the remaining current flow through winding 44 will cause actuation of the signal bell. Thus, with three ringing keys I am enabled to selectively call any one of four substations connected to a party line, the selective key or keys being first depressed to establish the proper circuit arrangement at the substations, and the ringing key 58 then actuated to ring the bell at the selected substation. By the addition of one selective key and another source of selective current, the available combinations will enable me to selectively connect any one of eight substations connected to the same party line, and with five keys I am enabled to selectively signal any one of sixteen substations connected with the same party line and on, each additional key doubling the previous number of substations. Each additional key, of course, calls for an additional armature for the selective device at the substations.

V. Viewed from the standpoint of their position in the circuit, the various contact sets for each selective device are either operative or inoperative. By an operative contact is meant one which when opened will adjust the associated bell circuit so that the bell may ring, as, for instance, the a contacts in station 2. By an inoperative contact is meant one which when opened will adjust the bell circuit to prevent the bell from ringing, such as the a contacts at substation 1. The number of contact sets at each station is the same as the number of harmonic frequencies provided at the central office. The position of these contacts in the 120 signaling circuit of any substation is determined by the following law: If a is the number of harmonic frequencies provided and m is the number of operative contacts at any substation, then m—n will be the number of inoperative contacts. I give here two tables, showing the position of operative and inoperative contacts for a four party line, as
shown in Fig. 1, and for an eight party line as diagrammatically illustrated in Fig. 6.

### 4 Party Combinations.

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>1</td>
<td>A-B</td>
<td>G</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>B+G</td>
</tr>
<tr>
<td>3</td>
<td>B</td>
<td>A+B</td>
</tr>
<tr>
<td>4</td>
<td>A-B</td>
<td>G+A</td>
</tr>
</tbody>
</table>

### 8 Party Combinations.

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>1</td>
<td>A-B-C</td>
<td>G</td>
</tr>
<tr>
<td>2</td>
<td>A-B</td>
<td>G+C</td>
</tr>
<tr>
<td>3</td>
<td>A-C</td>
<td>G+B</td>
</tr>
<tr>
<td>4</td>
<td>B-C</td>
<td>G+B+C</td>
</tr>
<tr>
<td>5</td>
<td>A-B</td>
<td>G+A</td>
</tr>
<tr>
<td>6</td>
<td>A-C</td>
<td>G+A+C</td>
</tr>
<tr>
<td>7</td>
<td>B-C</td>
<td>G+A+C</td>
</tr>
<tr>
<td>8</td>
<td>A-B-C</td>
<td>G+A+B+C</td>
</tr>
</tbody>
</table>

Fig. 6 illustrates diagrammatically the application of my invention to an eight party line system. From the detailed description of the four party line arrangement, the eight party line system will readily be understood by those skilled in the art.

In order to avoid unnecessary prolixity, I shall not follow this circuit in detail. Suffice it to say that the reference letters apply to similar parts in Fig. 6 as in Fig. 1. In addition to the G generator and the a and b generators and contacts associated with the cord circuit in Fig. 1, there is added in Fig. 6 a c generator with the associated transformer and ringing key.

Eight substations are shown in place of the four substations of Fig. 1, and all of the selective magnets are equipped with additional armatures or reeds lettered 81° tuned to respond to currents of the frequency of that delivered by the c generator. These additional armatures or reeds cooperate with contacts 82°. The c generator, of course, delivers a current of a frequency different from the frequency of either of the other selective generators a or b and different from that of the straight generator G. The mode of operation of the eight party arrangement will be apparent from the detailed description of the operation of the four party system and from the table showing the position of the operative and inoperative contacts for the eight party line system.

To illustrate the formula, consider station 5 on the 8 party line table. Here n or 70 the number of harmonic frequencies required at the central station is 3, and m, the number of operative contacts is 2. Therefore, the number of inoperative contacts is 75. If the a and b contacts would be operative, and the third or c contact would be inoperative. At substation 1 all the contacts would be inoperative which means that the operation of any one or more thereof will prevent ringing of the bell. For a sixteen party line, there will be four contact sets for each selective device and four frequency selective currents at the central exchange. At substation 1, the contacts would all be inoperative. At the second substation, contact a would be operative and the other contacts inoperative. At substation 3, contact b would be operative, and contacts a, c and d inoperative and so on. At substation 5, contacts a and c would be operative and contacts c and d inoperative and so on. This use of harmonic currents in combinations, I consider as being broadly new with me as also the use of ringing keys in various combinations for connecting the current sources with the line.

I do not wish to be limited to the arrangements herein shown nor to the exact construction of the selective device as shown. The cord circuit arrangement is only one of the many arrangements which might be used for connecting the various signaling currents with the line. Changes in the substation arrangements could also be made without departing from the scope of my invention.

What I claim as new and desire to secure by Letters Patent is:

1. In a telephone system, the combination with the two limbs of a telephone line circuit leading from a central exchange to a substation, of a signal bell at the substation connected in bridge of the line limbs, an electromagnetic circuit controlling device at the substation for controlling the circuit through the associated signal bell windings, the circuit controlling device being connected also in bridge of the said line limbs, and means at the central exchange for sending current of different character simultaneously over the line, the circuit controlling device being responsive to current of one character and the signal bell being responsive to current of different character.

2. In a telephone system, the combination with a telephone line connecting a central exchange with a substation, of means at the
central exchange for sending currents of different character into the line, a signal bell at the substation, a circuit controlling device at the substation for the signal bell circuit, a signal bell at the central exchange for sending currents of different character into the line, a signal bell at the central exchange, means for connecting said sources with the line to cause current therefrom to flow simultaneously over the line, a signal bell and a circuit controlling device at the substation, said signal bell having two windings normally connected in parallel branches with the line limbs and through contacts of the controlling device whereby said signal bell is normally insensitive to current flow, said selective device being responsive to current flow from one of said sources only to move its contacts to change the circuit conditions of the signal bells whereby said signal bell may be responsive to current flow from the other source.

5. In a telephone exchange system, the combination of a telephone line connecting a central exchange with a substation, sources of current of different character at the central exchange, means for connecting said sources with the line to cause current therefrom to flow simultaneously over the line, a signal bell at the substation normally connected in parallel branches with the line limbs and through contacts of the controlling device whereby said signal bell is normally insensitive to current flow, said selective device being responsive to current flow from one of said sources only to move its contacts to change the circuit conditions of the signal bells whereby said signal bell may be responsive to current flow from the other source.

6. In a telephone exchange system, the combination of a telephone line connecting a central exchange with a substation, sources of current of different character at the central exchange, means for connecting said sources with the line to cause current therefrom to flow simultaneously over the line, a signal bell at the substation normally connected in parallel branches with the line limbs and through contacts of the controlling device whereby said signal bell is normally insensitive to current flow, said selective device being responsive to current flow from one of said sources only to move its contacts to change the circuit conditions of the signal bells whereby said signal bell may be responsive to current flow from the other source.

7. In a telephone exchange system, the combination of a telephone line connecting a central exchange with a substation, sources of current of different character at the central exchange, means for connecting said sources with the line to cause current therefrom to flow simultaneously over the line, a signal bell at the substation normally connected in parallel branches with the line limbs and through contacts of the controlling device whereby said signal bell is normally insensitive to current flow, said selective device being responsive to current flow from one of said sources only to move its contacts to change the circuit conditions of the signal bells whereby said signal bell may be responsive to current flow from the other source.

8. In a telephone exchange system, the combination of a telephone line connecting a central exchange with a substation, sources of current of different character at the central exchange, means for connecting said sources with the line to cause current therefrom to flow simultaneously over the line, a signal bell at the substation normally connected in parallel branches with the line limbs and through contacts of the controlling device whereby said signal bell is normally insensitive to current flow, said selective device being responsive to current flow from one of said sources only to move its contacts to change the circuit conditions of the signal bells whereby said signal bell may be responsive to current flow from the other source.
ated, moving its contacts to open the bell circuit and the device at one of the other substations being actuated to move its contacts to disconnect one of the signal bell windings from circuit whereby when said sources are simultaneously connected with the line, only the signal bell at the other substation will be actuated.

9. In a telephone exchange system, the combination of a telephone line extending from a central exchange to a plurality of substations, sources of current of different character at the central exchange adapted for connection with the line, a signal bell at the first substation normally connected with the line limbs, a circuit controlling device at the first substation for normally controlling the signal bell circuit to render the signal bell operative, a signal bell at each of the other substations connected with the line, a circuit controlling device at each of the other substations normally controlling the signal bell circuits to render the signal bell inoperative, said controlling device being responsive to current from only one of said sources, the signal bell at the first substation being actuated upon current flow from the other source, and means adapted upon current flow from the first source to actuate the controlling device at the first substation to render the signal bell inoperative and to cause actuation of the controlling device at one of the other substations to rearrange the signal bell circuit to render the signal bell operative whereby current flow from the second source will cause actuation of the signal bell only at one of the other substations.

10. In a telephone exchange system, the combination of a telephone line connecting a central station with a plurality of substations, a source of ringing current at the central station adapted for connection with the line, a source of selective current at the central station also adapted for connection with the line, a circuit controlling device at one of the substations and a signal bell thereat whose winding is normally connected serially with the line limbs and through contacts of the controlling device, a selective controlling device at the other substation, a signal bell at the second substation having two windings normally connected in parallel with the line limbs through contacts of the controlling device and in a direction to be in opposition upon current flow there through, said controlling device being responsive only to current flow from the selective source, current flow from the source of ringing current alone causing actuation only of the signal bell at the first substation and simultaneous current flow from both sources causing operation of the controlling device at the first substation to open the circuit through the bell and operation of the controlling device at the second substation to break the parallel opposite relation of the signal bell windings whereby the current flow from the ringing source will actuate only the bell at the second substation.

11. In a telephone exchange system, the combination of a telephone line connecting a central exchange with a plurality of substations, a plurality of sources of selective current of different character at the central exchange adapted for connection with the telephone line, a selective circuit controlling device at each substation, sets of contacts for each one of said devices independently responsive to current flow of one character through the device, a signal bell at each substation connected with the line limbs through circuits controlled by the contact sets, said circuits being normally adjusted to cause the signal bells to be inoperative, said selective devices being connected with the line limbs, current flow through the line from one of said sources causing actuation of the corresponding contact sets at one of the substations only to rearrange the circuit conditions to render the signal bell operative, and a source of ringing current at the central exchange adapted for connection with the line when the source of selective current is connected therewith whereby the selected signal bell is operated.

12. In a telephone exchange system, the combination of a telephone line connecting a central station with a plurality of party line substations, a plurality of sources of selective current and a source of ringing current at the central exchange adapted for connection with the line, a signal bell at each substation having two windings normally connected in parallel and in opposition so that the bell is irresponsive to current flow from the ringing generator, an electromagnetic controlling device at each substation having a number of contact sets equal to the number of selective sources at the central station, each set actuated only upon current flow through the device from the corresponding source of selective current, circuits for the signal bells of each substation normally including the contacts of the controlling device, current flow from one of said selective sources causing actuation of the controlling devices at the substations and actuation of the corresponding contact sets, the signal bell circuit arrangement at only one of the substations being rearranged upon actuation of the contact set thereat to render the signal bell operative whereby current flow from the source of ringing current may operate said bell.

13. In a telephone exchange system, the combination of a telephone line connecting a central station with a plurality of party line substations, a plurality of sources of selective current and a source of ringing current at the central exchange adapted for connection with the line, a signal bell at each substation having two windings normally connected in parallel and in opposition so that the bell is irresponsive to current flow from the ringing generator, an electromagnetic controlling device at each substation having a number of contact sets equal to the number of selective sources at the central station, each set actuated only upon current flow through the device from the corresponding source of selective current, circuits for the signal bells of each substation normally including the contacts of the controlling devices, current flow from one of said selective sources causing actuation of the controlling devices at the substations and actuation of the corresponding contact sets, the signal bell circuit arrangement at only one of the substations being rearranged upon actuation of the contact set thereat to render the signal bell operative whereby current flow from the source of ringing current may operate said bell.
sources of alternating electromotive force of
different frequencies adapted to be im-
pressed upon said conductors in various
combinations, and means at each substation
for rendering the associated signaling appa-
ratus responsive to some particular combi-
nation of said electromotive force.
14. In a telephone exchange system, the
combination with a pair of conductors, of a
plurality of substations connected therewith,
signaling apparatus at each substation,
sources of alternating electromotive force of
different frequencies adapted to be im-
pressed upon said conductors in various
combinations, and means at each substation
for rendering the associated signaling appa-
ratus responsive to some particular combi-
nation of said electromotive force and irre-
 sponsive to all other combinations.
15. In a telephone system, the combina-
tion with a central exchange, of a pair of
conductors leading from the central ex-
change to a plurality of substations, a signal
bell at each substation included in a nor-
mally closed circuit in bridge of the line
limbs, sources of alternating selecting cur-
rents of different frequencies at the central
exchange, means at the central exchange for
connecting said sources of selecting currents
of different frequencies in various combina-
tions with the line, a selective device at each
substation, each responsive to a certain com-
bination of currents delivered from said
sources of selecting currents and each con-
trolling a circuit of the corresponding signal
bell, and a source of ringing current at the
central exchange adapted for connection
with said pair of conductors simultaneously
with the connection of the source or sources
of selecting currents.
16. In a selective signaling system, the
combination with a pair of conductors con-
necting a central office with a plurality of
substations, of sources of selective currents
of different character located at the central
exchange, means located at the central ex-
change for connecting said sources with said
pair of conductors in various combinations,
a selective device at each substation, a signal
bell at each substation, each signal bell be-
ing connected in bridge of the pair of con-
ductors through a circuit controlled by the
associated selective device, each selective de-
vice being actuated to establish an inopera-
tive condition in the associated signal bell
circuit when actuated by any combination of
selective currents except one, and a source of
ringing current at the central office adapt-
ed for connection with said pair of conduc-
tors simultaneously with the connection of
said sources of selective currents to actuate
the selected signal bell.
17. In a telephone system, the combina-
tion with a telephone line connecting a cen-
tral exchange with a plurality of substations,
of a signal bell at each substation, sources at the central exchange for supply-
ing selective currents of different character,
means at the central exchange for connect-
ing said sources with the line in various
combinations, a selective device at each sub-
station responsive in different ways to dif-
f erent combinations of selective currents
sent over the line, each selective device con-
trolling the circuit for the corresponding
signal bell, a certain combination of selec-
tive currents sent over the line causing actu-
ation of only one of the selective devices to
render the corresponding signal bell opera-
tive and causing actuation of all the other
devices to hold the corresponding signal
bells in inoperative condition, and a source
of ringing current at the central exchange
adapted for connection with the line to cause
ringing of the selected signal bell.
18. In a telephone exchange system, the
combination with a line connecting a cen-
tral exchange with a plurality of substations,
of a signal bell at each substation, a plurality
of sources at the central exchange for sup-
plying selective currents of different fre-
quencies, means for connecting said sources
with the line in various combinations, a
selective device at each substation having a
plurality of contacts mutually controlling
the circuit of the corresponding signal bell,
a certain combination of selective currents
sent into the line causing operation of the
selective devices at the substations to actuate
the corresponding contacts so that at one
substation only the contacts will be actuated
to adjust the signal bell circuit to render the
signal bell operative and so that at the other
substations the contacts will be actuated to
maintain the signal bells inoperative, and
a source of signaling current at the central
exchange adapted for connection with the
line to send signaling current through the
selected signal bell.
19. In a telephone system, the combina-
tion with a telephone line connecting a cen-
tral exchange with a plurality of substations,
of a signal bell at each substation, sources at the central exchange for supply-
ing selective currents of different character,
means for connecting said sources in vari-
ous combinations with the line, an electro-
magnetic device at each substation having
two armatures, each responsive to one of the
selective currents, the contacts controlled by
each armature and the contacts of each de-
vice cooperating to control the circuit for
the corresponding signal bell, a certain com-
bination of selective currents sent into the
line causing actuation of the corresponding
armatures of the selective devices, the re-
sultant arrangement of the contacts at only
one of the substations being such that the
corresponding signal bell circuits are arranged to render the signal bell operative and the arrangement of the contacts at the other substations are such that the signal bells are maintained in inoperative condition, and a source of ringing current at the central exchange adapted for connection with the line to send ringing current through the selected signal bell.

20. In a selective signaling system, the combination with a plurality of stations connected with a pair of conductors, of a signal bell at each station, a plurality of sources of selective currents of different frequencies adapted for connection with said pair of conductors, means for connecting two or more of said sources of selective currents simultaneously with said pair of conductors, a selective device at each station having a plurality of contacts mutually controlling the circuit of the corresponding signal bell, the selective devices at the substations being responsive to various combinations of selective current flow to render one of the signal bells operative and the other signal bells inoperative, and a source of ringing current adapted for connection with said pair of conductors for supplying ringing current to ring the selected signal bell.

21. In a selective signaling system, the combination with a plurality of stations connected with a pair of conductors, of a signal bell at each station, a plurality of sources of selective currents of different frequencies adapted for connection with said pair of conductors, means for connecting two or more of said sources of selective currents simultaneously with said pair of conductors, and a selective device at each station having a plurality of contacts mutually controlling the circuit of the corresponding signal bell, the selective devices at the substations being responsive to various combinations of selective current flow to render one of the signal bells operative and the other signal bells inoperative.

22. In a telephone system, in combination, a plurality of tuned reeds, electromagnets for actuating said reeds, and a telephonic signaling instrument controlled in its operation by said reeds jointly.

23. In combination in a telephone system, a series of stations, a plurality of differently tuned reeds at each station, electromagnets for vibrating the reeds at said stations, means for impressing electromotive forces of different frequencies upon each electromagnet in various combinations, and telephonic signaling mechanism at each station whose operation is controlled by said reeds.

24. In combination in a telephone system, a series of stations, a plurality of differently tuned reeds at each station, electromagnets for vibrating the reeds at said stations, means for impressing electromotive forces of different frequencies upon each electromagnet in various combinations, and a telephonic signaling instrument at each station controlled in its operation by said reeds jointly.

25. In combination, a series of stations, a plurality of differently tuned reeds at each station, electromagnets for actuating said reeds, a common circuit for supplying current to said electromagnets, means for impressing electromotive forces of different frequencies upon the electromagnet circuit in various combinations, a signaling device at each station controlled in its operation by said reeds jointly, and a signal bell circuit at each station jointly controlled by the reeds at said station.

26. In combination in a telephone system, a series of stations, a plurality of differently tuned reeds at each station, electromagnets for actuating said reeds, a common circuit for supplying current to said electromagnets, means for impressing electromotive forces of different frequencies upon the electromagnet circuit in various combinations, and a telephone bell at each station whose connection with the electromagnet circuit is controlled by the associated reeds.

27. In combination, a series of stations, a plurality of differently tuned reeds at each station, electromagnets for actuating said reeds, a common circuit for supplying current to said electromagnets, means for impressing electromotive forces of different frequencies upon the electromagnet circuit in various combinations, a signaling device at each station controlled in its operation by said reeds jointly, and a special source of current for actuating the signaling devices.

28. In combination, a series of stations, a plurality of differently tuned reeds at each station, electromagnets for actuating said reeds, a pair of conductors in bridge of which the electromagnets are connected, sources of electromotive forces of different frequencies adapted to be impressed upon said conductors in various combinations, and an electric signaling device connected in bridge of said conductors at each station, the circuit of each signaling device being controlled by the associated reeds.

29. In a selective signaling system, the combination with a series of stations, a plurality of differently tuned reeds at each station, electromagnets for actuating said reeds, a pair of conductors in bridge of which said electromagnets are connected, sources of alternating electromotive forces of different frequencies adapted to be impressed upon said conductors in various combinations, the vibration rate of the reeds at each station corresponding with the frequencies of said sources, an electric signaling device at each station included in a circuit in bridge of said
conductors, the circuit of each signaling device being controlled by the associated reeds whereby a particular signaling device is operatively connected in bridge of said conductors to correspond with the connection of each combination of alternating electro motive forces in the circuit, and a separate source of current adapted for connection with said conductors to operate the signaling devices.

30. In combination, a plurality of differently tuned reeds, common electromagnetic means for vibrating the reeds, means for directing currents of different character through the electromagnetic means to cause selective operation of the reeds, and electrically operated mechanism adapted to be controlled in its operation by such reeds jointly.

31. In combination, a plurality of tuned reeds, a common electromagnetic means for vibrating the reeds, means for directing currents of different character through the electromagnetic means to cause selective operation of the reeds, and signaling mechanism adapted to be controlled in its operation by said reeds jointly.

32. In combination, a plurality of tuned reeds, a common electromagnetic means for vibrating the reeds, sources for producing current flows of different frequencies, means for selectively connecting said current flows with the electromagnetic means to cause vibration of the correspondingly tuned reeds, and signaling mechanism adapted to be controlled by said reeds jointly.

33. In combination, a plurality of tuned reeds, a common electromagnet for vibrating the reeds, means for impressing electro motive forces of different frequencies upon the electromagnet in various combinations to cause one of the reeds to be selected and vibrated, a signaling circuit controlled by each reed, and a signaling instrument adapted to be controlled in its operation by said reeds jointly.

In witness whereof, I haveunto subscribe my name this 21st day of January, A. D., 1907.

ARTHUR F. POOLE.

Witnesses:
A. A. POOLE,
LAURA V. POOLE.