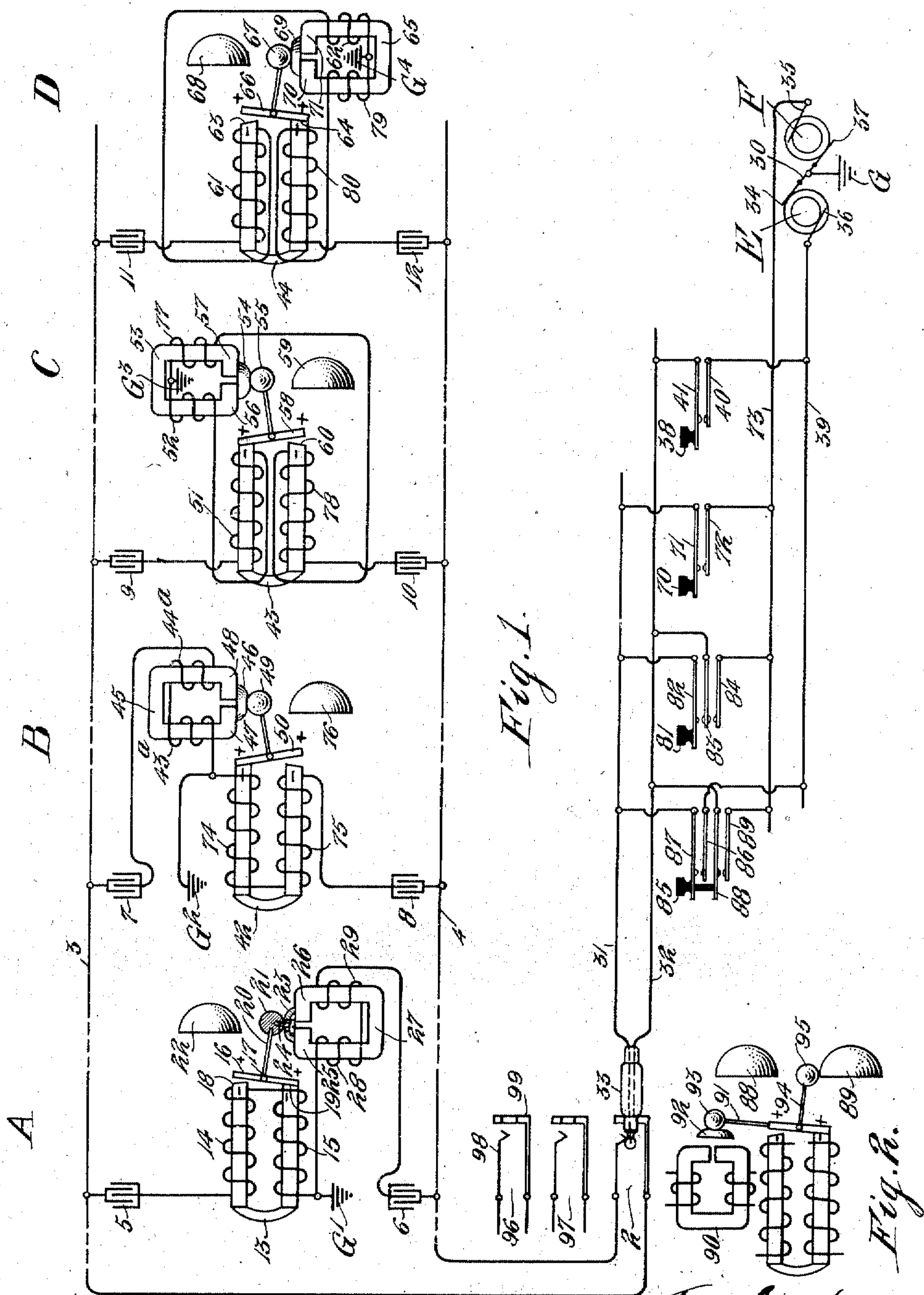


J. ERICKSON.  
SELECTIVE SIGNALING SYSTEM.  
APPLICATION FILED AUG. 16, 1905.

984,202.

Patented Feb. 14, 1911.



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# UNITED STATES PATENT OFFICE.

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## SELECTIVE SIGNALING SYSTEM.

984,202.

Specification of Letters Patent.

Patented Feb. 14, 1911.

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*To all whom it may concern:*

Be it known that I, JOHN ERICKSON, a citizen of the United States of America, and resident of Chicago, Cook county, Illinois, have invented a certain new and useful Improvement in Selective Signaling Systems, of which the following is a specification.

My invention relates to electrical signaling systems in general, but more particularly to selective signaling systems of such character that any one of a plurality of signal-receiving devices can be operated to the exclusion of the others, even though the said signal-receiving devices are all connected with the same circuit, and especially to selective signaling systems which are adapted more particularly for use in connection with a party-line telephone system.

Generally stated, the object of my invention is the provision of an improved and highly efficient selective signaling system.

Special objects of my invention are the provision of an improved construction and arrangement whereby different electric currents may be employed for selectively ringing a number of bells which are distributed along a party telephone line, it being possible for the operator at the exchange or central station to ring any bell to the exclusion of the others by simply pressing one of a corresponding number of ringing keys on the switchboard; the provision of an improved construction and arrangement whereby the different bells or ringers located at the different stations along a party telephone line may be selectively rung or operated by means of a pair of alternating current generators which are bridged in series across the operator's cord-circuit, the middle point of the bridge between the generators being grounded with respect to ground connections provided at the subscribers' stations, and the operator being provided with switching apparatus of such character that current from the first generator may be thrown upon one side of the telephone line, that current from the second generator may be thrown upon the other side of the line, that current from the said second generator may be thrown upon both sides of the line, or so that current from the first generator may be thrown on one side of the line at the same time that current from the second generator is thrown upon the other side of the line, thus giving the four different electri-

cal conditions in the party-line, and thus enabling the operator to signal any subscriber without ringing the bells at the other stations on the same line, it being understood that the different subscribers' bells or ringers have different circuit arrangements and are related differently to the line-circuit; the provision of an improved electromagnetic locking arrangement for the subscribers' bells or ringers, of such character that when the operator presses the proper key for ringing one bell, the strikers of all other bells on the same line will be prevented from vibrating, thus permitting the operator to operate any bell or ringer at will; the provision of an improved construction and circuit arrangement for the polarized electric bells or ringers comprised in the signal-receiving apparatus of the selective signaling system of a party-line telephone system; and the provision of certain details of construction and features of improvement tending to increase the general efficiency and desirability of a party-line telephone system of this particular character.

To the foregoing and other useful ends, my invention consists in matters hereinafter set forth and claimed.

In the accompanying drawings, Figure 1 is a diagram illustrating the construction and circuit arrangement of a party-line telephone system embodying the principles of my invention. Fig. 2 is a diagrammatic view illustrating another form of electric bell or ringer for the subscriber's signal-receiving apparatus.

As thus illustrated, the jack 2 represents one of the line-terminals at the central station, but it will be understood that the style of such terminals is unimportant. The conductors 3 and 4 of one of the party-lines, in connection with which I have elected to describe my invention, terminates in the said jack 2; and the four subscriber stations A, B, C and D are bridged across said line, in the order named, through the medium of the condensers 5 and 6, 7 and 8, 9 and 10, and 11 and 12, respectively. Station A, for example, is provided with two condensers 5 and 6, to which are connected the leads that pass through the ringer 13. Said ringer is of the usual type, having a core provided with two windings 14 and 15, each coil being of approximately 500 ohms. The armature 16 is, of course, polarized and



pivoted to any suitable support by means of a pin 17, which latter passes through the central portion of the armature and extends at right angles to the pole-pieces 18 and 19. Said armature carries a reed 20 to the end of which is secured a ball 21. Said ball, when the pole-piece 18 attracts the armature 16, strikes the bell 22. To the said ball, on the side away from the bell, there is attached a shoe 23, of magnetic material, which is secured to said ball loosely by the screw 24. Normally, the armature 16 is at rest in such manner that the shoe 23 is in contact with the pole-pieces 25 and 26 of the controlling magnet 27. Said magnet comprises a core upon which the coils 28 and 29 are wound. If said core becomes magnetized, the shoe-like armature 23, being attracted, prevents the ball 21 from vibrating back and forth and from striking the bell 22. The generators E and F are connected in series, and care is taken that they run in synchronism. The common connecting conductor 30 is connected to ground at G.

In Fig. 1, the cord conductors 31 and 32 are shown temporarily connected with the line-conductors 4 and 3 through the medium of the jack 2 and the plug 33. In this description, and solely for the sake of clearness, the conductor 3 will be known as the sleeve-conductor, and the conductor 4 as the tip-conductor. For the same reason, it will be assumed that the armatures of the generators E and F are, for an instant, in such positions that the terminals 34 and 35 may be considered negative terminals, and the terminals 36 and 37 positive. Then the connections being as indicated, and when the push-button 38 is pressed, a flow of current passes from the generator E along the conductor 39 and through the springs 40 and 41 to the conductor 32, thence to the line-conductor 3, through each of the condensers 5, 7, 9 and 11 to the ground-terminals G<sup>1</sup>, G<sup>2</sup>, G<sup>3</sup> and G<sup>4</sup>, back to the grounded terminal G, and then to the generator E. Of the four ringers 13, 42, 43 and 44, bridged across the party-line in question, only the one at the station A will become active, and the reason will be apparent. The path of the current through the first station is from the conductor 3, through the condenser 5 and the windings 14 and 15 of the ringer 13 to the ground terminal G<sup>1</sup>, and back to the generator E. The windings on the ringer 13 are so arranged that they reinforce or augment each other. There being no other forces to be considered at the time, the armature 16 being polarized positively (as are the other ringer armatures) is attracted to the pole-piece 18 and repelled from the pole-piece 19. Therefore, the ball 21 will strike the bell 22 and produce a signal. It is very evident that if the button 38 is

pressed for a reasonable length of time, the direction of the current will then be reversed through the ringer 13, since the generators are alternators, and that in time, therefore, the polarity of the pole-pieces 18 and 19 will be reversed; then the armature 16 will be repelled by the pole-piece 18 and attracted by the pole-piece 19, thereby causing the armature to be shifted in the opposite direction. This will be repeated as often as there is a reversal of current, thus causing the bell to ring. This form of ringer is, however, very common. At station B the current, in passing from conductor 3 to the ground terminal G<sup>2</sup>, passes only through the windings 44<sup>a</sup> and 43<sup>a</sup> of the magnet 45. These coils are so wound that the electromagnet 45 becomes energized, and the shoe 46 attracted and held to the pole-pieces 47 and 48.

It is evident that as long as any current passes through the electromagnet in question, in any direction, the armature or shoe 46 will be held, and that the ringer at the second station will remain silent, because the ball 49 has no tendency to be moved by the armature 50. At the third station C the current passes through the conductor 9, the coil 51 of the ringer 43, and the coil 52 of the electromagnet 53, to the ground terminal G<sup>3</sup>. In this case both the ringer 43 and the electromagnet 53 become energized, since the current passes through one of the windings in each. The shoe 54 of the ball 55 will be attracted by the pole-pieces 56 and 57; therefore, said ball will be held away from the ringer 59 and prevented from giving a signal. The magnetic force of the electromagnet 53 is stronger than that developed at the ringer 43, owing to the air-gap between the armature 58 and the pole-piece 60, so that the ringer apparatus at this station C remains silent. At the fourth station D the current from the conductor 3 passes through the condenser 11 and the coils 61 and 62 to the ground terminal G<sup>4</sup>. The pole pieces 63 and 64 are thus magnetized, and the electromagnet 65 is magnetized also. The armature 66 is then attracted by the pole-piece 63 and repelled by the pole-piece 64. The tendency, therefore, will be to force the ball 67 against the bell 68; but the magnetic force at the electromagnet 65, owing to the closed magnetic circuit through the shoe 69, is strong enough to overcome the force developed by the ringer 44. The latter force is weaker by reason of the air-gap between the armature 66 and the pole-piece 63. Eventually, the current is reversed, and the polarity of the pole-pieces 63 and 64 will be reversed likewise, but still the armature 69 will be held by the pole-pieces 70 and 71. Thus it is clear that when the button 38 is pressed, only one station—the station A—will respond and give a sig-



nal. In this way, the signaling apparatus at the first station becomes active because the ringer 13 become energized, and because the controlling electromagnet 27 does not become energized. At the second station, the bell is kept silent because the controlling magnet 45 becomes magnetized while the ringer-magnet remains deenergized. At the third station, both the controlling electromagnet and the ringer become energized; but since the electromagnet presents a closed magnetic circuit, and the ringer-electromagnet an open magnetic circuit, the former overcomes the tendency of the latter to produce any vibration of the ringer-armature; and at the fourth station the same thing is true. When the push-button 70 is pressed, the tip-conductor 4 is, through the medium of the conductor 31 and the springs 71 and 72 and the conductor 73, placed in connection with the terminal 35 of the generator F. A current will then flow from the terminal 37 of said generator F to the grounded terminal G, and thence through the ground terminals G<sup>1</sup>, G<sup>2</sup>, G<sup>3</sup> and G<sup>4</sup> of the several stations to the tip-conductor 4. At the first station the current passes from the ground terminal G<sup>1</sup> through the windings 28 and 29 of the electromagnet 27, and through the condenser 6 to the tip-conductor 4. Since the windings of said electromagnet reinforce or augment each other, the latter becomes magnetized, and the shoe 23 and the ball 21 are held securely against the pole-pieces 25 and 26. There being no energizing current through the ringer-magnet 13, there will be no tendency at that station to ring the bell 22. At the second station B, however, the current passes from the ground terminal G<sup>2</sup>, through the windings 74 and 75, and through the condenser 8, to the tip-conductor 4. These windings reinforcing or augmenting each other, the ringer-magnet becomes energized, and there being no magnetizing force at the controlling magnet 45, the bell 76 is rung. At the third station the current passes from the ground terminal G<sup>3</sup>, through the coil 77 of the magnet 53, and through the coil 78 of the ringer 43, thence through the condenser 10 to the tip-conductor 4. Both the controlling magnet 53 and the ringer-magnet 43 become energized, but the force of the former overcomes that in the latter, because of the air-gap between the armature 58 and the pole-piece 60, which renders the reluctance of the magnetic circuit including said armature and pole-piece comparatively large, consequently, no signaling sound is produced at station C. At the fourth station—station D—the current passes from the ground terminal G<sup>4</sup> through the winding 79 of the controlling magnet 65, through the coil 80 and through the condenser 12, to the tip-conductor 4. For the same reason

ascribed to the third station, this station also remains silent. Therefore, when the button 70 is pressed only the second station B responds. Again, when the button 81 is pressed, the conductors 31 and 32 are brought together by the springs 82, 83 and 84, and placed in connection with the lead 73 that constitutes the terminal 35 of the generator F. The current, therefore, passes through the ground terminals G<sup>1</sup>, G<sup>2</sup>, G<sup>3</sup> and G<sup>4</sup>, and branches in each station to the tip and sleeve conductors 4 and 3 to the generator terminal 35.

At the first station the current passes through the ground terminal G<sup>1</sup>, the coils 15 and 14 of the ringer-magnet 13, through the condenser 5 to the sleeve-conductor 3, and also from the ground terminal G<sup>1</sup> through the windings 28 and 29 of the controlling magnet 27, and through the condenser 6 to the tip-conductor 4. It is evident then that since both windings of the ringer-magnet and both windings of the controlling magnet reinforce or augment each other, both of said magnets become energized. The latter, however, has the advantage over the former, in that its magnetic circuit is strong enough to overcome the pull of the former, because of the air-gap between the armature 16 and the pole-piece 18. Therefore, the sounder 21 is retained away from the ringer 22. At the second station the current passes from the ground terminal G<sup>2</sup>, through both the windings 74 and 75 of the ringer-magnet 42, and thence to the tip-conductor 4, through the condenser 8, and by another branch through the windings 43<sup>a</sup> and 44<sup>a</sup> of the controlling magnet 45 to the sleeve-conductor 3, through the condenser 7. Both the ringer and the controlling magnets become energized, as in the first station, but for the same reason set forth in connection with said first station, when the controlling magnet becomes magnetized, the signaling apparatus at the second station does not become operative. At the third station the two current-branches extend from the ground terminal G<sup>3</sup>, through the winding 77 of the controlling magnet 53, and the winding 78 of the ringer-magnet 43 to the tip-conductor 4, and from the ground terminal G<sup>3</sup> through the coils 52 and 51 to the sleeve-conductor 3. In this case, the way in which the current passes through the coils 77 and 52 of the controlling magnet renders said magnet neutral. However, the magnetic force developed in the coils of the ringer-magnet causes the said coils to reinforce or augment each other, and the result is that the armature 58 of that ringer-magnet 43 is operated by the ringing current. At the fourth station the current at the ground terminal G<sup>4</sup> divides and flows over two paths. One path is through the coil 62 and



of the magnet 65, and through the coil 61 of the ringer-magnet 44 to the sleeve-conductor 3; and the other circuit is through the coils 79 and 80 to the tip-conductor 4. The current passing through the coils 61 and 80 of the ringer-magnet 44 neutralizes their magnetic properties, while the coils in the controlling magnet reinforce or augment each other, and in this way retain the striker 67, through the shoe 69, against the pole-pieces 70 and 71. Thus it is seen that when the third push-button 81 is depressed, only the ringing apparatus at the third station becomes active. When the fourth button 85 is pressed; the terminal 36 of the generator E is connected to the tip-conductor through the springs 86 and 87, and the terminal 35 of the generator F to the sleeve-conductor 3 through the springs 88 and 89. Therefore, in this instance, the generators E and F are connected in series across the conductors 3 and 4. The circuits being balanced, the current will pass from one of the line-conductors to the other through all the coils at each station, but no circuit will be closed through the ground. This is true, since each of the four coils associated with the ringing apparatus at each station is of approximately 500 ohms resistance. The current in passing from the sleeve-conductor 3 to the tip-conductor 4, through the first station, through the coils 14 and 15, and through the coils 28 and 29, magnetizes both the ringer-magnet and the controlling magnet; but since the magnetic circuit of the latter has a lower reluctance than the magnetic circuit of the former, owing to the air-gap between the armature 16 and the pole-piece 18, the armature 16 is prevented from vibrating by the attraction of the shoe 23 to the pole-pieces 25 and 26. At the second station both the magnets also become energized, and for the reason described in connection with the first station, the ringer is prevented from operating. At the third station the windings 52 and 77 of the controlling magnet reinforce or augment each other, but those of the ringer-magnet 43 cancel or neutralize each other, and the ringers remain quiet. At the fourth station the windings of the controlling magnet neutralize each other, while those of the ringer-magnet reinforce or augment each other, with the result that the armature 66 vibrates in unison with the current. When the button 85 is pressed, and the line-conductors 3 and 4 connected across the ringer-generators E and F, in the manner explained, it was stated that the stations A, B and C would remain inoperative. Referring to station A, if the armature 16 happens to be so situated that the shoe 23 is not against the pole-pieces of the controlling magnet 27, said armature will then move until the shoe 23 strikes the control-

ling magnet 27, after which operation it will remain locked, for reasons already described. The same might be true of any other station when some one of the ringing-buttons 38, 70, 81 or 85 is pressed. This, however, is of no importance, and does not interfere with the desired selective character of the operation at any time.

It is clear then, from the preceding explanation, that by the combined use of the two generators E and F, the line-conductors 3 and 4, and a common return, which is illustrated in the drawing as the ground, and by the use of the series of contact-points substantially as described, a combination of circuits is attained by which any one of four stations on a line may be signaled without disturbing any one of the other stations on the same line. It is also evident that by means of a plug, or any other suitable means, the circuits connecting with the generators of the central office may be temporarily joined to any of the party-lines which may terminate in said central station. Four stations have been described on a line in Fig. 1, but it will be understood that it is not essential for practical purposes that there be such a number—that is, any number can be employed. If desired, a single station (the fourth or D station, for instance) could be signaled, if it were the only one on the line, by depressing the proper button, in this case button 85. The current will pass from the conductor 3 through the ringing apparatus, as previously described, and back to the other conductor 4, and for reasons already pointed out the bell would be rung. The same is true of any other one or more of the stations already described.

Fig. 2 shows a modified form of the ringing apparatus of my invention. In this case two bells 88 and 89 are supplied, instead of one, and the controlling magnet 90 is put to one side, with the reed 91 carrying the magnetic shoe 92 on the ball 93, and a separate reed 94 carries the ringer-ball 95. In using this modified ringing apparatus there would be no change in the connection from what has already been described. The operation would be identical, but the striker 95 would, at either stroke, ring a bell, instead of ringing once out of every two strokes, as hitherto explained. If another line were connected to either one of the jacks 96 or 97—jack 96 for instance—the line-conductors would terminate at the tip-spring 98 and sleeve 99, and the four stations bridged across said line would be arranged in harmony with the stations described in Fig. 1. By applying the plug 33 to the jack 96, the operation of the instruments on said line would be identical with those previously described. Although I have illustrated certain apparatus and cir-



cuits, of my design, as comprised in a system of my invention; I do not limit myself to the particular arrangement described in connection with the drawings.

5 With the arrangement shown and described, the bell at the subscriber's station A is rung by current from the generator E, through the medium of a grounded circuit including the line-conductor 3. In a similar  
10 way, the bell at the subscriber's station B is rung by current from the generator F, through the medium of a grounded circuit including the line-conductor 4. The bell at the subscriber's station C is rung by means  
15 of current derived from the generator F, through the medium of the grounded circuit including the line-conductors 3 and 4 in parallel. Finally, the bell at the subscriber's station D is rung by current from  
20 both of said generators, and through the medium of a complete metallic line-circuit including the two line-conductors 3 and 4 in series. At this time, the two generators are also connected in series with each other.  
25 It will be understood that for this reason, and as previously explained, the two generators must be operated in such manner that the impulses from one generator, in one direction, must occur at the same time  
30 that impulses are produced in the same direction by the other generator. In other words, the two generators are synchronized and in phase with each other, so to speak, and in this way it is possible to connect the  
35 two generators in series in the metallic line-circuit without having the alternating current generated by one interfere with the similar current produced by the other.

It will be understood that the various devices and instruments can be of any suitable, known or approved mechanical construction, and that the resistance of the various coils can be changed or adjusted to suit the requirements of different cases. In the drawings no telephone instruments are shown at  
40 the subscribers' stations, or in connection with the operator's cord-circuit. It will be understood, however, that telephone instruments of any suitable, known or approved character can be provided at the different  
50 subscribers' stations, and in conjunction with the operator's cord-circuit, so that any subscriber can talk to any other subscriber on the same line, or to a subscriber on some other line. If a centralized source of supply  
55 is employed for furnishing the electric current necessary for operating the line and supervisory signals, or for talking purposes also, the condensers included in the bell-bridges at the subscribers' stations will prevent the flow of battery current there-  
60 through. It will also be understood that the various coils in the bell-bridges at the subscribers' stations can be so adjusted as to afford sufficient impedance to prevent the

voice-currents from short-circuiting through the bells. Any suitable arrangement can be employed for enabling the telephone subscribers to attract the attention of the operator—that is to say, any suitable, known  
70 or approved line or supervisory signaling apparatus may be employed in conjunction with my improved selective signaling apparatus.

I do not limit myself to the exact construction shown and described, as it is obvious that various changes and modifications can be made therein without departing from the spirit of my invention.

What I claim as my invention is:—

1. A selective signaling system comprising a line-circuit, a plurality of signal-receiving means connected with the said circuit, and a calling apparatus for selectively  
80 operating said signal-receiving means over the said circuit, said calling apparatus including a couple of synchronized alternating current-generators, said generators being connected in series and grounded at a point between them, and each signal-receiving  
85 means comprising a polarized ringer, and a magnet adapted when energized to prevent the bell from ringing, the operating circuit of at least one signal-receiving means including the bell in series with a winding  
90 of its associated magnet.

2. A selective signaling system comprising a line-circuit, a plurality of signal-receiving means connected with the said circuit, and a calling apparatus for selectively operating  
100 the said signal-receiving means over the said circuit, said calling apparatus including a couple of generators connected in series and grounded at a point between them, and each signal-receiving means comprising a polarized  
105 ringer, and a magnet adapted when energized to prevent the bell from ringing, the operating circuit of at least one signal-receiving means including the bell in series with a winding of its associated magnet.

3. A selective signaling system comprising a line-circuit, a plurality of signal-receiving means connected with the said circuit, each signal-receiving means being grounded, and a calling apparatus for selectively operating  
115 the said signal-receiving means over the said circuit, said calling apparatus including a couple of generators connected in series and grounded at a point between them, and each signal-receiving means comprising  
120 a polarized ringer, and a magnet adapted when energized to prevent the bell from ringing, the operating circuit of at least one signal-receiving means including the bell in series with a winding of its associated  
125 magnet.

4. A selective signaling system comprising a line-circuit, a plurality of signal-receiving means connected with the said circuit, each signal-receiving means being grounded,  
130



and a calling apparatus normally disconnected from the said line-circuit, but adapted to be connected therewith for the purpose of selectively operating the said signal-receiving means, said calling apparatus including a plurality of generators connected in series and grounded at a point between them, together with a plurality of ringing-keys controlling the flow of current from the generators to the line-circuit and corresponding in number to the said signal-receiving means, and each signal-receiving means comprising a polarized ringer, and a magnet adapted when energized to prevent the bell from ringing, the operating circuit of at least one signal-receiving means including the bell in series with a winding of its associated magnet.

5. A selective signaling system comprising a metallic line-circuit, a plurality of signal-receiving means bridged across the said line-circuit, each-bridge being grounded and including a pair of condensers arranged at opposite sides of the signal-receiving means; and a calling apparatus for selectively operating the said signal-receiving means over the said line-circuit, said calling apparatus including a plurality of alternating current-generators connected in series, and each connected with ground, together with a plurality of selective ringing-keys corresponding in number to the signal-receiving means, and adapted for connecting up the generators in as many different circuits as there are signal-receiving means, and each signal-receiving means comprising a polarized ringer, and a magnet adapted when energized to prevent the bell from ringing, the operating circuit of at least one signal-receiving means including the bell in series with a winding of its associated magnet.

6. A selective signaling system comprising a complete metallic subscriber's line, a spring-jack in which the said line terminates, a cord-circuit provided with a plug adapted for insertion in said jack, a plurality of alternating current-generators connected in series and grounded at a point between them, a plurality of keys for variously connecting the generators with either one or both sides of the cord-circuit, and a plurality of signal-receiving means bridged across the said line, each bridge being grounded, and each signal-receiving means being adapted to be operated by its allotted key and no other, and each signal-receiving means comprising a polarized ringer, and a magnet adapted when energized to prevent the bell from ringing, the operating circuit of at least one signal-receiving means including the bell in series with a winding of its associated magnet.

7. A selective signaling system comprising a complete metallic subscriber's line, a

plurality of signal-receiving means bridged across the said circuit, each bridge being grounded and including a pair of condensers arranged at opposite sides of said signal-receiving means, and a calling apparatus normally disconnected from the said line, but adapted to be connected thereto for the purpose of selectively operating the said signal-receiving means over the said line, said calling apparatus including a plurality of alternating current-generators, together with switching devices adapted for variously connecting one or more of said generators with either one or both sides of the line-circuit, and whereby said generators may be connected up in as many different circuits as there are signal-receiving means, each signal-receiving means being responsive only when its allotted circuit is closed, and each signal-receiving means comprising a polarized ringer, and a magnet adapted when energized to prevent the bell from ringing, the operating circuit of at least one signal-receiving means including the bell in series with a winding of its associated magnet.

8. A selective signaling system comprising a line-circuit, four signal-receiving means connected with the said circuit, and a calling apparatus for selectively operating said signal-receiving means over the said circuit, said calling apparatus including a couple of synchronized alternating current-generators, said generators being connected in series and grounded at a point between them, and each signal-receiving means comprising a polarized electric bell, and an electro-magnet bridged in series with the coils of the bell and adapted when energized to prevent the latter from ringing.

9. A selective signaling system comprising a line-circuit, four signal-receiving means connected with the said circuit, and calling apparatus for selectively operating the said signal-receiving means over the said circuit, said calling apparatus including a couple of generators connected in series and grounded at a point between them, and each signal-receiving means comprising a polarized electric bell, and an electro-magnet bridged in series with the coils of the bell and adapted when energized to prevent the latter from ringing.

10. A selective signaling system comprising a line-circuit, four signal-receiving means connected with the said circuit, each signal-receiving means being grounded, and a calling apparatus for selectively operating the said signal-receiving means over the said circuit, said calling apparatus including a couple of generators connected in series and grounded at a point between them, and each signal-receiving means comprising a polarized electric bell, and an electro-magnet bridged in series with the coils of the bell



and adapted when energized to prevent the latter from ringing.

11. A selective signaling system comprising a line-circuit, four signal-receiving means connected with the said circuit, each signal-receiving means being grounded, and a calling apparatus normally disconnected from the said line-circuit, but adapted to be connected therewith for the purpose of selectively operating the said signal-receiving means, said calling apparatus including a plurality of generators connected in series and grounded at a point between them, together with a plurality of ringing-keys controlling the flow of current from the generators to the line-circuit and corresponding in number to the said signal-receiving means, and each signal-receiving means comprising a polarized electric bell, and an electro-magnet bridged in series with the coils of the bell and adapted when energized to prevent the latter from ringing.

12. A selective signaling system comprising a metallic line-circuit, a plurality of signal-receiving means bridged across the said circuit, each bridge being grounded, and a calling apparatus normally disconnected from the said line-circuit, but adapted to be connected thereto for the purpose of selectively operating said signal-receiving means, said calling apparatus including a plurality of alternating current-generators connected in series and grounded at a point between them, together with a plurality of ringing-keys whereof one is adapted for including one of said generators in series with the ground and one side of the line-circuit, another for connecting the other side of the line-circuit in series with the ground and the other generator, another for connecting one of the generators in a ground-circuit including both sides of the line-circuit in parallel, and the other for connecting both generators in series in a complete metallic circuit including both sides of the line, and each signal-receiving means comprising a polarized electric bell, and an electro-magnet connected in series with the coils of the bell and adapted when energized to prevent the latter from ringing.

13. A selective signaling system comprising a complete metallic subscriber's line, a plurality of signal-receiving means bridged across the said circuit, each bridge being grounded and including a pair of condensers arranged at opposite sides of said signal-receiving means, and a calling apparatus normally disconnected from the said line, but adapted to be connected thereto for the purpose of selectively operating the said signal-receiving means over the said line, said calling apparatus including a plurality of alternating current-generators, together with switching devices adapted for variously connecting one or more of said generators with

either one or both sides of the line-circuit, and whereby said generators may be connected up in as many different circuits as there are signal-receiving means, each signal-receiving means being responsive only when its allotted circuit is closed, and each signal-receiving means comprising a polarized electric bell, and an electro-magnet connected in series with the coils of the bell and adapted when energized to prevent the latter from ringing.

14. A selective signaling system comprising a line-circuit, a plurality of signal-receiving means connected with the said circuit, and a calling apparatus for selectively operating said signal-receiving means over the said circuit, said calling apparatus including a couple of synchronized alternating current-generators, said generators being connected in series and grounded at a point between them, and each signal-receiving means comprising an electric bell or ringer, and an electro-magnet having two coils connected in series with the coils of said bell, said magnet being adapted when energized to prevent the bell from ringing.

15. A selective signaling system comprising a line-circuit, a plurality of signal-receiving means connected with the said circuit, each signal-receiving means being grounded, and a calling apparatus for selectively operating the said signal-receiving means over the said circuit, said calling apparatus including a couple of generators connected in series and grounded at a point between them, and each signal-receiving means comprising an electric bell or ringer, and an electro-magnet having two coils connected in series with the coils of said bell, said magnet being adapted when energized to prevent the bell from ringing, the operating circuit of at least one signal-receiving means including the bell in series with a winding of its associated magnet.

16. A selective signaling system comprising a line-circuit, a plurality of signal-receiving means connected with the said circuit, each signal-receiving means being grounded, and a calling apparatus normally disconnected from the said line-circuit, but adapted to be connected therewith for the purpose of selectively operating the said signal-receiving means, said calling apparatus including a plurality of generators connected in series and grounded at a point between them, together with a plurality of ringing-keys controlling the flow of current from the generators to the line-circuit and corresponding in number to the said signal-receiving means, and each signal-receiving means comprising an electric bell or ringer, and an electro-magnet having two coils connected in series with the coils of said bell, said magnet being adapted when energized to prevent the bell from ringing, the operating



ing circuit of at least one signal-receiving means including the bell in series with a winding of its associated magnet.

17. A selective signaling system comprising a metallic line-circuit, a plurality of signal-receiving means bridged across the said circuit, each bridge being grounded, and a calling apparatus normally disconnected from the said line-circuit, but adapted to be connected thereto for the purpose of selectively operating said signal-receiving means, said calling apparatus including a plurality of alternating current-generators connected in series and grounded at a point between them, together with a plurality of ringing-keys whereof one is adapted for including one of said generators in series with the ground and one side of the line-circuit, another for connecting the other side of the line-circuit in series with the ground and the other generator, another for connecting one of the generators in a ground-circuit including both sides of the line-circuit in parallel, and the other for connecting both generators in series in a complete metallic circuit including both sides of the line, and each signal-receiving means comprising an electric bell or ringer, and an electro-magnet having two coils connected in series with the coils of said bell, said magnet being adapted when energized to prevent the bell from ringing.

18. A selective signaling system comprising a complete metallic subscriber's line, a spring-jack in which the said line terminates, a cord-circuit provided with a plug adapted for insertion in said jack, a plurality of alternating current-generators connected in series and grounded at a point between them, a plurality of keys for variously connecting the generators with either one or both sides of the cord-circuit, and a plurality of signal-receiving means bridged across the said line, each bridge being grounded, and each signal-receiving means being adapted to be operated by its allotted key and no other and each signal-receiving means comprising an electric bell or ringer, and an electro-magnet having two coils connected in series with the coils of said bell, said magnet being adapted when energized to prevent the bell from ringing.

19. A selective signaling system comprising a complete metallic subscriber's line, a plurality of signal-receiving means bridged across the said circuit, each bridge being grounded and including a pair of condensers arranged at opposite sides of said signal-receiving means, and a calling apparatus normally disconnected from the said line, but adapted to be connected thereto for the purpose of selectively operating the said signal-receiving means over the said line, said calling apparatus including a plurality of alternating current-generators, together

with switching devices adapted for variously connecting one or more of said generators with either one or both sides of the line-circuit, and whereby said generators may be connected up in as many different circuits as there are signal-receiving means, each signal-receiving means being responsive only when its allotted circuit is closed, and each signal-receiving means comprising an electric bell or ringer, and an electro-magnet having two coils connected in series with the coils of said bell, said magnet being adapted when energized to prevent the bell from ringing.

20. A selective signaling system comprising a line-circuit, a plurality of signal-receiving means connected with the said circuit, and calling apparatus for selectively operating the said signal-receiving means over the said circuit, said calling apparatus including a couple of generators connected in series and grounded at a point between them, and one of said signal-receiving means comprising an electric bell adapted to be energized when current passes through its two coils in series, an electro-magnet adapted when energized to prevent the bell from ringing, said electro-magnet being adapted to be energized when current passes through its coil, together with a ground connection extending from between the bell and electro-magnet, the operating circuit of at least one signal-receiving means including the bell in series with a winding of its associated magnet.

21. A selective signaling system comprising a line-circuit, a plurality of signal-receiving means connected with the said circuit, each signal-receiving means being grounded, and a calling apparatus for selectively operating the said signal-receiving means over the said circuit, said calling apparatus including a couple of generators connected in series and grounded at a point between them, and one of said signal-receiving means comprising an electric bell adapted to be energized when current passes through its two coils in series, an electro-magnet adapted when energized to prevent the bell from ringing, said electro-magnet being adapted to be energized when current passes through its coil, together with a ground connection extending from between the bell and electro-magnet, the operating circuit of at least one signal-receiving means including the bell in series with a winding of its associated magnet.

22. A selective signaling system comprising a line-circuit, a plurality of signal-receiving means connected with the said circuit, each signal-receiving means being grounded, and a calling apparatus normally disconnected from the said line-circuit, but adapted to be connected therewith for the purpose of selectively operating the said



signal-receiving means, said calling apparatus including a plurality of generators connected in series and grounded at a point between them, together with a plurality of ringing-keys controlling the flow of current from the generators to the line-circuit and corresponding in number to the said signal-receiving means, and one of said signal-receiving means comprising an electric bell adapted to be energized when current passes through its two coils in series; an electro-magnet adapted when energized to prevent the bell from ringing, said electro-magnet being adapted to be energized when current passes through its coil, together with a ground connection extending from between the bell and electro-magnet, the operating circuit of at least one signal-receiving means including the bell in series with a winding of its associated magnet.

23. A selective signaling system comprising a line-circuit, a plurality of signal-receiving means connected with the said circuit, and calling apparatus for selectively operating the said signal-receiving means over the said circuit, said calling apparatus including a couple of generators connected in series and grounded at a point between them, and one of said signal-receiving means comprising an electric bell adapted to be energized when current passes through its coils in series, an electro-magnet provided with two coils and adapted when energized to prevent the bell from ringing, said electro-magnet being adapted to be energized when current passes through one of its coils, but not when current passes through both of its coils in series, and a connection extending to ground from a point between the coils of said electro-magnet, the operating circuit of at least one signal-receiving means including the bell in series with a winding of its associated magnet.

24. A selective signaling system comprising a line-circuit, a plurality of signal-receiving means connected with the said circuit, each signal-receiving means being grounded, and a calling apparatus for selectively operating the said signal-receiving means over the said circuit, said calling apparatus including a couple of generators connected in series and grounded at a point between them, and one of said signal-receiving means comprising an electric bell adapted to be energized when current passes through its coils in series, an electro-magnet provided with two coils and adapted when energized to prevent the bell from ringing, said electro-magnet being adapted to be energized when current passes through one of its coils but not when current passes through both of its coils in series, and a connection extending to ground from a point between the coils of said electro-magnet, the operating circuit of at least one signal-receiving means includ-

ing the bell in series with a winding of its associated magnet.

25. A selective signaling system comprising a line-circuit, a plurality of signal-receiving means connected with the said circuit, each signal-receiving means being grounded, and a calling apparatus normally disconnected from the said line-circuit, but adapted to be connected therewith for the purpose of selectively operating the said signal-receiving means, said calling apparatus including a plurality of generators connected in series and grounded at a point between them, together with a plurality of ringing-keys controlling the flow of current from the generators to the line-circuit and corresponding in number to the said signal-receiving means, and one of said signal-receiving means comprising an electric bell adapted to be energized when current passes through its coils in series, an electro-magnet provided with two coils and adapted when energized to prevent the bell from ringing, said electro-magnet being adapted to be energized when current passes through one of its coils, but not when current passes through both of its coils in series, and a connection extending to ground from a point between the coils of said electro-magnet, the operating circuit of at least one signal-receiving means including the bell in series with a winding of its associated magnet.

26. A selective signaling system comprising a line-circuit, a plurality of signal-receiving means connected with the said circuit, and calling apparatus for selectively operating the said signal-receiving means over the said circuit, said calling apparatus including a couple of generators connected in series and grounded at a point between them, and one of said signal-receiving means comprising an electric bell adapted to be energized when current passes through its two coils in series, an electro-magnet adapted when energized to prevent the bell from ringing, said electro-magnet being adapted to be energized when current passes through its coil, together with a ground connection extending from between the bell and electro-magnet, the coil of the electro-magnet being connected in series with and at one side of the coils of the bell, the operating circuit of at least one signal-receiving means including the bell in series with a winding of its associated magnet.

27. A selective signaling system comprising a line-circuit, a plurality of signal-receiving means connected with the said circuit, each signal-receiving means being grounded, and a calling apparatus for selectively operating the said signal-receiving means over the said circuit, said calling apparatus including a couple of generators connected in series and grounded at a point between them, and one of said signal-receiving-



ing means comprising an electric bell adapted to be energized when current passes through its two coils in series, an electro-magnet adapted when energized to prevent the bell from ringing, said electro-magnet being adapted to be energized when current passes through its coil, together with a ground connection extending from between the bell and electro-magnet, the coil of the electro-magnet being connected in series with and at one side of the coils of the bell, the operating circuit of at least one signal-receiving means including the bell in series with a winding of its associated magnet.

28. A selective signaling system comprising a line-circuit, a plurality of signal-receiving means connected with the said circuit, each signal-receiving means being grounded, and a calling apparatus normally disconnected from the said line-circuit, but adapted to be connected therewith for the purpose of selectively operating the said signal-receiving means, said calling apparatus including a plurality of generators connected in series and grounded at a point between them, together with a plurality of ringing-keys controlling the flow of current from the generators to the line-circuit and corresponding in number to the said signal-receiving means, and one of said signal-receiving means comprising an electric bell adapted to be energized when current passes through its two coils in series, an electro-magnet adapted when energized to prevent the bell from ringing, said electro-magnet being adapted to be energized when current passes through its coil, together with a ground connection extending from between the bell and electro-magnet, the coil of the electro-magnet being bridged in series with and at one side of the coils of the bell, the operating circuit of at least one signal-receiving means including the bell in series with a winding of its associated magnet.

29. A selective signaling system comprising a line-circuit, a plurality of signal-receiving means connected with the said circuit, and a calling apparatus for selectively operating said signal-receiving means over the said circuit, said calling apparatus including a couple of synchronized alternating current-generators, said generators being connected in series and grounded at a point between them, and one of said signal-receiving means comprising an electric bell adapted to be energized when current passes through its coils in series, an electro-magnet provided with two coils and adapted when energized to prevent the bell from ringing, said electro-magnet being adapted to be energized when current passes through one of its coils, but not when current passes through both of its coils in series, and a connection extending to ground from a point between the coils of said electro-magnet, the coils of

the electro-magnet being connected between and in series with the coils of the bell.

30. A selective signaling system comprising a line-circuit, a plurality of signal-receiving means connected with the said circuit, and calling apparatus for selectively operating the said signal-receiving means over the said circuit, said calling apparatus including a couple of generators connected in series and grounded at a point between them, and one of said signal-receiving means comprising an electric bell adapted to be energized when current passes through its coils in series, an electro-magnet provided with two coils and adapted when energized to prevent the bell from ringing, said electro-magnet being adapted to be energized when current passes through one of its coils, but not when current passes through both of its coils in series, and a connection extending to ground from a point between the coils of said electro-magnet, the coils of the electro-magnet being connected between and in series with the coils of the bell.

31. A selective signaling system comprising a line-circuit, a plurality of signal-receiving means connected with the said circuit, each signal-receiving means being grounded, and a calling apparatus for selectively operating the said signal-receiving means over the said circuit, said calling apparatus including a couple of generators connected in series and grounded at a point between them, and one of said signal-receiving means comprising an electric bell adapted to be energized when current passes through its coils in series, an electro-magnet provided with two coils and adapted when energized to prevent the bell from ringing, said electro-magnet being adapted to be energized when current passes through one of its coils, but not when current passes through both of its coils in series, and a connection extending to ground from a point between the coils of said electro-magnet, the coils of the electro-magnet being connected between and in series with the coils of the bell.

32. A selective signaling system comprising a line-circuit, a plurality of signal-receiving means connected with the said circuit, each signal-receiving means being grounded, and a calling apparatus normally disconnected from the said line-circuit, but adapted to be connected therewith for the purpose of selectively operating the said signal-receiving means, said calling apparatus including a plurality of generators connected in series and grounded at a point between them, together with a plurality of ringing-keys controlling the flow of current from the generators to the line-circuit and corresponding in number to the said signal-receiving means, and one of said signal-receiving means comprising an electric bell



adapted to be energized when current passes through its coils in series, an electro-magnet provided with two coils and adapted when energized to prevent the bell from ringing, said electro-magnet being adapted to be energized when current passes through one of its coils, but not when current passes through both of its coils in series, and a connection extending to ground from a point between the coils of said electro-magnet, the coils of the electro-magnet being connected between and in series with the coils of the bell.

33. A selective signaling system comprising a metallic line-circuit, a plurality of signal-receiving means bridged across the said circuit, each bridge being grounded, and a calling apparatus normally disconnected from the said line-circuit, but adapted to be connected thereto for the purpose of selectively operating said signal-receiving means, said calling apparatus including a plurality of alternating current-generators connected in series and grounded at a point between them, together with a plurality of ringing-keys whereof one is adapted for including one of said generators in series with the ground and one side of the line-circuit, another for connecting the other side of the line-circuit in series with the ground and the other generator, another for connecting one of the generators in a ground-circuit including both sides of the line-circuit in parallel, and the other for connecting both generators in series in a complete metallic circuit including both sides of the line, and one of said signal-receiving means comprising an electric bell adapted to be energized when current passes through its coils in series, an electro-magnet provided with two coils and adapted when energized to prevent the bell from ringing, said electro-magnet being adapted to be energized when current passes through one of its coils, but not when current passes through both of its coils in series, and a connection extending to ground from a point between the coils of said electro-magnet, the coils of the electro-magnet being connected between and in series with the coils of the bell.

34. A selective signaling system comprising a metallic line-circuit, a plurality of signal-receiving means bridged across the said line-circuit, each bridge being grounded and including a pair of condensers arranged at opposite sides of the signal-receiving means, and a calling apparatus for selectively operating the said signal-receiving means over the said line-circuit, said calling apparatus including a plurality of alternating current-generators connected in series, and each connected with ground, together with a plurality of selective ringing-keys corresponding in number to the signal-receiving means, and adapted for connecting up the genera-

tors in as many different circuits as there are signal-receiving means, and one of said signal-receiving means comprising an electric bell adapted to be energized when current passes through its coils in series, an electro-magnet provided with two coils and adapted when energized to prevent the bell from ringing, said electro-magnet being adapted to be energized when current passes through one of its coils, but not when current passes through both of its coils in series, and a connection extending to ground from a point between the coils of said electro-magnet, the coils of the electro-magnet being connected between and in series with the coils of the bell.

35. A selective signaling system comprising a complete metallic subscriber's line, a spring-jack in which the said line terminates, a cord-circuit provided with a plug adapted for insertion in said jack, a plurality of alternating current-generators connected in series and grounded at a point between them, a plurality of keys for variously connecting the generators with either one or both sides of the cord-circuit, and a plurality of signal-receiving means bridged across the said line, each bridge being grounded, and each signal-receiving means being adapted to be operated by its allotted key and no other, and one of said signal-receiving means comprising an electric bell adapted to be energized when current passes through its coils in series, an electro-magnet provided with two coils and adapted when energized to prevent the bell from ringing, said electro-magnet being adapted to be energized when current passes through one of its coils, but not when current passes through both of its coils in series, and a connection extending to ground from a point between the coils of said electro-magnet, the coils of the electro-magnet being connected between and in series with the coils of the bell.

36. A selective signaling system comprising a complete metallic subscriber's line, a plurality of signal-receiving means bridged across the said circuit, each bridge being grounded and including a pair of condensers arranged at opposite sides of said signal-receiving means, and a calling apparatus normally disconnected from the said line, but adapted to be connected thereto for the purpose of selectively operating the said signal-receiving means over the said line, said calling apparatus including a plurality of alternating current-generators, together with switching devices adapted for variously connecting one or more of said generators with either one or both sides of the line-circuit, and whereby said generators may be connected up in as many different circuits as there are signal-receiving means, each signal-receiving means being responsive only



when its allotted circuit is closed, and one of said signal-receiving means comprising an electric bell adapted to be energized when current passes through its coils in series, an  
 5 electro-magnet provided with two coils and adapted when energized to prevent the bell from ringing, said electro-magnet being adapted to be energized when current passes through one of its coils, but not when cur-  
 10 rent passes through both of its coils in series, and a connection extending to ground from a point between the coils of said electro-magnet, the coils of the electro-magnet being connected between and in series with  
 15 the coils of the bell.

37. A selective signaling system comprising a line-circuit, a plurality of signal-receiving means connected with the said circuit, and calling apparatus for selectively  
 20 operating the said signal-receiving means over the said circuit, said calling apparatus including a couple of generators connected in series and grounded at a point between them, and one of said signal-receiving means  
 25 comprising an electric bell adapted to be energized when current passes through its coils in parallel, but not when current passes through its coils in series, and an electro-magnet adapted when energized to prevent  
 30 the bell from ringing, said electro-magnet being adapted to be energized when current passes through its coil, together with a connection extending to ground from a point between the coils of said electro-magnet, the  
 35 operating circuit of at least one signal-receiving means including the bell in series with a winding of its associated magnet.

38. A selective signaling system comprising a line-circuit, a plurality of signal-re-  
 40 ceiving means connected with the said circuit, each signal-receiving means being grounded, and a calling apparatus for selectively operating the said signal-receiving means over the said circuit, said calling ap-  
 45 paratus including a couple of generators connected in series and grounded at a point between them, and one of said signal-receiving means comprising an electric bell adapted to be energized when current passes  
 50 through its coils in parallel, but not when current passes through its coils in series, and an electro-magnet adapted when energized to prevent the bell from ringing, said electro-magnet being adapted to be energized  
 55 when current passes through its coil, together with a connection extending to ground from a point between the coils of said electro-magnet, the operating circuit of at least one signal-receiving means includ-  
 60 ing the bell in series with a winding of its associated magnet.

39. A selective signaling system comprising a line-circuit, a plurality of signal-receiving means connected with the said circuit, each  
 65 signal-receiving means being grounded, and

a calling apparatus normally disconnected from the said line-circuit, but adapted to be connected therewith for the purpose of selec-  
 tively operating the said signal-receiving means, said calling apparatus including a plu- 70-  
 rality of generators connected in series and grounded at a point between them, together with a plurality of ringing-keys controlling the flow of current from the generators to the  
 line-circuit and corresponding in number 75  
 to the said signal-receiving means, and one of said signal-receiving means comprising an electric bell adapted to be energized when current passes through its coils in par-  
 80 allel, but not when current passes through its coils in series, and an electro-magnet adapted when energized to prevent the bell from ringing, said electro-magnet being adapted to be energized when current passes through its coil, together with a connection  
 85 extending to ground from a point between the coils of said electro-magnet, the operating circuit of at least one signal-receiving means including the bell in series with a winding of its associated magnet. 90

40. A selective signaling system comprising a line-circuit, a plurality of signal-re-  
 ceiving means connected with the said cir-  
 cuit, and a calling apparatus for selectively  
 operating said signal-receiving means over 95  
 the said circuit, said calling apparatus including a couple of synchronized alternating current-generators, said generators being connected in series and grounded at a point  
 between them, and one of said signal-receiv- 100  
 ing means comprising an electric bell adapted to be energized when current passes through its coils in parallel, but not when current passes through its coils in series, and an  
 electro-magnet provided with two coils and 105  
 adapted when energized to prevent the bell from ringing, said electro-magnet being adapted to be energized when current passes through its coils in series, together with a  
 connection extending to ground from a point 110  
 between the coils of said electro-magnet, the coils of said electro-magnet being connected between and in series with the coils of the bell.

41. A selective signaling system compris- 115  
 ing a line-circuit, a plurality of signal re-  
 ceiving means connected with the said cir-  
 cuit, and calling apparatus for selectively  
 operating the said signal-receiving means  
 over the said circuit, said calling apparatus 120  
 including a couple of generators connected in series and grounded at a point between them, and one of said signal-receiving means comprising an electric bell adapted to be en-  
 125 ergized when current passes through its coils in parallel, but not when current passes through its coils in series, and an electro-magnet provided with two coils and adapted when energized to prevent the bell from  
 ringing, said electro-magnet being adapted 130



to be energized when current passes through its coils in series, together with a connection extending to ground from a point between the coils of said electro-magnet, the coils of  
5 said electro-magnet being connected between and in series with the coils of the bell.

42. A selective signaling system comprising a line-circuit, a plurality of signal-receiving means connected with the said circuit,  
10 each signal-receiving means being grounded, and a calling apparatus for selectively operating the said signal-receiving means over the said circuit, said calling apparatus including a couple of generators  
15 connected in series and grounded at a point between them, and one of said signal-receiving means comprising an electric bell adapted to be energized when current passes through its coils in parallel, but not when  
20 current passes through its coils in series, and an electro-magnet provided with two coils and adapted when energized to prevent the bell from ringing, said electro-magnet being adapted to be energized when current passes  
25 through its coils in series, together with a connection extending to ground from a point between the coils of said electro-magnet, the coils of said electro-magnet being connected between and in series with the  
30 coils of the bell.

43. A selective signaling system comprising a line-circuit, a plurality of signal-receiving means connected with the said circuit, each signal-receiving means being  
35 grounded, and a calling apparatus normally disconnected from the said line-circuit, but adapted to be connected therewith for the purpose of selectively operating the said signal-receiving means, said calling apparatus including a plurality of generators  
40 connected in series and grounded at a point between them, together with a plurality of ringing-keys controlling the flow of current from the generators to the line-circuit and  
45 corresponding in number to the said signal-receiving means, and one of said signal-receiving means comprising an electric bell adapted to be energized when current passes through its coils in parallel, but not when  
50 current passes through its coils in series, and an electro-magnet provided with two coils and adapted when energized to prevent the bell from ringing, said electro-magnet being adapted to be energized when current  
55 passes through its coils in series, together with a connection extending to ground from a point between the coils of said electro-magnet, the coils of said electro-magnet being connected between and in series with  
60 the coils of the bell.

44. A selective signaling system comprising a metallic line-circuit, a plurality of signal-receiving means bridged across the said  
65 circuit, each bridge being grounded, and a calling apparatus normally disconnected

from the said line-circuit, but adapted to be connected thereto for the purpose of selectively operating said signal-receiving means, said calling apparatus including a  
70 plurality of alternating current-generators connected in series and grounded at a point between them, together with a plurality of ringing-keys whereof one is adapted for including one of said generators in series with  
75 the ground and one side of the line-circuit, another for connecting the other side of the line-circuit in series with the ground and the other generator, another for connecting one of the generators in a ground-circuit including both sides of the line-circuit in  
80 parallel, and the other for connecting both generators in series in a complete metallic circuit including both sides of the line, and one of said signal-receiving means comprising an electric bell adapted to be energized  
85 when current passes through its coils in parallel, but not when current passes through its coils in series, and an electro-magnet provided with two coils and adapted when energized to prevent the bell from ringing,  
90 said electro-magnet being adapted to be energized when current passes through its coils in series, together with a connection extending to ground from a point between the coils of said electro-magnet, the coils  
95 of said electro-magnet being connected between and in series with the coils of the bell.

45. A selective signaling system comprising a metallic line-circuit, a plurality of signal-receiving means bridged across the  
100 said line-circuit, each bridge being grounded, and including a pair of condensers arranged at opposite sides of the signal-receiving means, and a calling apparatus for selectively operating the said signal-receiving  
105 means over the said line-circuit, said calling apparatus including a plurality of alternating current-generators connected in series, and each connected with ground, together with a plurality of selective ringing-keys  
110 corresponding in number to the signal-receiving means, and adapted for connecting up the generators in as many different circuits as there are signal-receiving means, and one of said signal-receiving means comprising an electric bell adapted to be energized  
115 when current passes through its coils in parallel, but not when current passes through its coils in series, and an electro-magnet provided with two coils and adapted when energized to prevent the bell from ringing, said electro-magnet being adapted  
120 to be energized when current passes through its coils in series, together with a connection extending to ground from a point between the coils of said electro-magnet, the coils of said electro-magnet being connected between  
125 and in series with the coils of the bell.

46. A selective signaling system comprising a complete metallic subscriber's line, a  
130



spring-jack in which the said line terminates, a cord-circuit provided with a plug adapted for insertion in said jack, a plurality of alternating current-generators connected in series and grounded at a point between them, a plurality of keys for variously connecting the generators with either one or both sides of the cord-circuit, and a plurality of signal-receiving means bridged across the said line, each bridge being grounded, and each signal-receiving means being adapted to be operated by its allotted key and no other, and one of said signal-receiving means comprising an electric bell adapted to be energized when current passes through its coils in parallel, but not when current passes through its coils in series, and an electro-magnet provided with two coils and adapted when energized to prevent the bell from ringing, said electro-magnet being adapted to be energized when current passes through its coils in series, together with a connection extending to ground from a point between the coils of said electro-magnet, the coils of said electro-magnet being connected between and in series with the coils of the bell.

47. A selective signaling system comprising a complete metallic subscriber's line, a plurality of signal-receiving means bridged across the said circuit, each bridge being grounded and including a pair of condensers arranged at opposite sides of said signal-receiving means, and a calling apparatus normally disconnected from the said line, but adapted to be connected thereto for the purpose of selectively operating the said signal-receiving means over the said line, said calling apparatus including a plurality of alternating current-generators, together with switching devices adapted for variously connecting one or more of said generators with either one or both sides of the line-circuit, and whereby said generators may be connected up in as many different circuits as there are signal-receiving means, each signal-receiving means being responsive only when its allotted circuit is closed, and one of said signal-receiving means comprising an electric bell adapted to be energized when current passes through its coils in parallel, but not when current passes through its coils in series, and an electro-magnet provided with two coils and adapted when energized to prevent the bell from ringing, said electro-magnet being adapted to be energized when current passes through its coils in series, together with a connection extending to ground from a point between the coils of said electro-magnet, the coils of said electro-magnet being connected between and in series with the coils of the bell.

48. A selective signaling system comprising a plurality of signal-receiving means, together with means for selectively operating

the said signal-receiving means, and each signal-receiving means comprising a polarized ringer, and a magnet adapted when energized to prevent the bell from ringing, the operating circuit of at least one signal-receiving means including the bell in series with a winding of its associated magnet.

49. A selective signaling system comprising a plurality of signal-receiving means, together with means for selectively operating the said signal-receiving means, and each signal-receiving means comprising a polarized electric bell, and an electro-magnet connected in series with the coils of the bell and adapted when energized to prevent the latter from ringing, the operating circuit of at least one signal-receiving means including the bell in series with a winding of its associated magnet.

50. A selective signaling system comprising a plurality of signal-receiving means, together with means for selectively operating the said signal-receiving means, and each signal-receiving means comprising an electric bell or ringer, and an electro-magnet having two coils connected in series with the coils of said bell, said magnet being adapted when energized to prevent the bell from ringing, the operating circuit of at least one signal-receiving means including the bell in series with a winding of its associated magnet.

51. A selective signaling system comprising a plurality of signal-receiving means, together with means for selectively operating the said signal-receiving means, and one of said signal-receiving means comprising an electric bell adapted to be energized when current passes through its two coils in series, an electro-magnet adapted when energized to prevent the bell from ringing, said electro-magnet being adapted to be energized when current passes through its coil, together with a ground connection extending from between the bell and electro-magnet, the operating circuit of at least one signal-receiving means including the bell in series with a winding of its associated magnet.

52. A selective signaling system comprising a plurality of signal-receiving means, together with means for selectively operating the said signal-receiving means, and one of said signal-receiving means comprising an electric bell adapted to be energized when current passes through its two coils in series, an electro-magnet adapted when energized to prevent the bell from ringing, said electro-magnet being adapted to be energized when current passes through its coil, together with a ground connection extending from between the bell and electro-magnet, the coil of the electro-magnet being connected in series with and at one side of the coils of the bell, the operating circuit of at least



one signal-receiving means including the bell in series with a winding of its associated magnet.

53. A selective signaling system comprising a plurality of signal-receiving means, together with means for selectively operating the said signal-receiving means, and one of said signal-receiving means comprising an electric bell adapted to be energized when current passes through its coils in series, an electro-magnet provided with two coils and adapted when energized to prevent the bell from ringing, said electro-magnet being adapted to be energized when current passes through one of its coils, but not when current passes through both of its coils in series, and a connection extending to ground from a point between the coils of said electro-magnet, the coils of the electro-magnet being connected between and in series with the coils of the bell.

54. A selective signaling system comprising a plurality of signal-receiving means, together with means for selectively operating the said signal-receiving means, and one of said signal-receiving means comprising an electric bell adapted to be energized when current passes through its coils in parallel, but not when current passes through its coils in series, and an electro-magnet provided with two coils and adapted when energized to prevent the bell from ringing, said electro-magnet being adapted to be energized when current passes through its coils in series, together with a connection extending to ground from a point between the coils of said electro-magnet, the operating circuit of at least one signal-receiving means including the bell in series with a winding of its associated magnet.

55. A selective signaling system comprising a plurality of signal-receiving means, together with means for selectively operating the said signal-receiving means, and one of said signal-receiving means comprising an electric bell adapted to be energized when current passes through its coils in parallel, but not when current passes through its coils in series, and an electro-magnet provided with two coils and adapted when energized to prevent the bell from ringing, said electro-magnet being adapted to be energized when current passes through its coils in series, together with a connection extending to ground from a point between the coils of said electro-magnet, the coils of said electro-magnet being connected between and in series with the coils of the bell.

56. A selective signaling system comprising a line-circuit, a plurality of signal-receiving means each bridged across the said circuit, together with means for selectively operating the said signal-receiving means, each signal-receiving means comprising an

electric bell and an electro-magnet connected in series, each electro-magnet having two coils and being adapted when energized to prevent its allotted bell from ringing, two of said bridges being grounded from a point between the electric bell and the electro-magnet, and two of said bridges being grounded from a point between the coils of the electro-magnet.

57. A selective signaling system comprising a line-circuit, a plurality of signal-receiving means connected in parallel across the said circuit, means including a plurality of grounded sources of current supply for selectively operating said signal-receiving means, each signal-receiving means comprising an electric bell and an electro-magnet connected in series across the line-circuit, each electro-magnet having two coils and being adapted when energized to prevent its allotted bell from ringing, a plurality of said signal-receiving means being connected to ground from a point between the electric bell and the electro-magnet, and a plurality of said signal-receiving means being connected to ground from a point between the coils of the electro-magnet.

58. A selective signaling system comprising a line-circuit, an electric bell and an electro-magnet bridged in series across the line-circuit and connected to ground from a point between them, said electro-magnet being arranged at one side of the bell, another electric bell and electro-magnet similarly bridged across the line-circuit and connected to ground from a point between them, but the electro-magnet in this case being arranged at the other side of the bell, another electric bell and electro-magnet bridged across the line-circuit and connected to ground from a point between the coils of the electro-magnet, the electro-magnet in this case having two coils and being connected between the coils of the bell, another electric bell and electro-magnet connected in series across the line-circuit and grounded at a point between the coils of the electro-magnet, the electro-magnet in this case having two differential coils and being connected between the coils of the bell, a plurality of alternating current-generators connected in series and grounded at a point between them, and switching apparatus for variously connecting the generators in as many different circuits as there are electric bells, whereby any electric bell may be rung to the exclusion of all others on the same line.

59. In a telephone exchange system, the combination of a telephone line, a plurality of substations on said line, a ringer at each substation, a ringing circuit for each ringer, an electro-magnet for each ringer, and means for supplying alternating ring-



ing currents through said circuits to selectively operate said ringers, each electro-magnet provided with means for preventing all except the proper current from operating its allotted ringer, one of said electro-magnets provided with two windings included in series in the ringing circuit of its ringer.

60. In a telephone exchange system, the combination of a telephone line, a plurality of substations on said line, a ringer at each substation, a ringing circuit for each ringer, an electro-magnet for each ringer, and means for supplying alternating ringing currents through said circuits to selectively operate said ringers, each electro-magnet provided with means for preventing all except the proper current from operating its allotted ringer, one of said electro-magnets provided with two windings included in series in the ringing circuit of its ringer, said windings being connected to ground at a point between them, said current supply means being also grounded.

61. In a telephone exchange system, the combination of a telephone line, a plurality of substations on said line, a ringer at each substation, a ringing circuit for each ringer, an electro-magnet for each ringer, and means for supplying alternating ringing currents through said circuits to selectively operate said ringers, each electro-magnet provided with means for preventing all except the proper current from operating its allotted ringer, one of said elec-

tro-magnets provided with two windings included in series in the ringing circuit of its ringer, the said windings being adapted to oppose each other when the ringer allotted thereto is operated.

62. In a telephone exchange system, the combination of a telephone line, a plurality of substations on said line, a ringer at each substation, a ringing circuit for each ringer, an electro-magnet for each ringer, and means for supplying alternating ringing currents through said circuits to selectively operate said ringers, each electro-magnet provided with means for preventing all except the proper current from operating its allotted ringer, one of said electro-magnets provided with two windings included in series in the ringing circuit of its ringer, said windings being connected to ground at a point between them, said current supply means being also grounded, the said windings being adapted to oppose each other when the ringer allotted thereto is operated.

63. In a telephone system, a party-line, a couple of synchronized generators, a ringing circuit including the two generators in series with the two sides of the line, and means for bridging the said generators on the line.

Signed by me at Chicago, Cook county, Illinois, this 27th day of July, 1905.

JOHN ERICKSON.

Witnesses:

R. C. GIFFORD,

W. LEE CAMPBELL.