

S. S. STOLP.
MEASURED SERVICE TELEPHONE SYSTEM.
APPLICATION FILED FEB. 29, 1912.

1,214,969.

Patented Feb. 6, 1917.

3 SHEETS—SHEET 1.

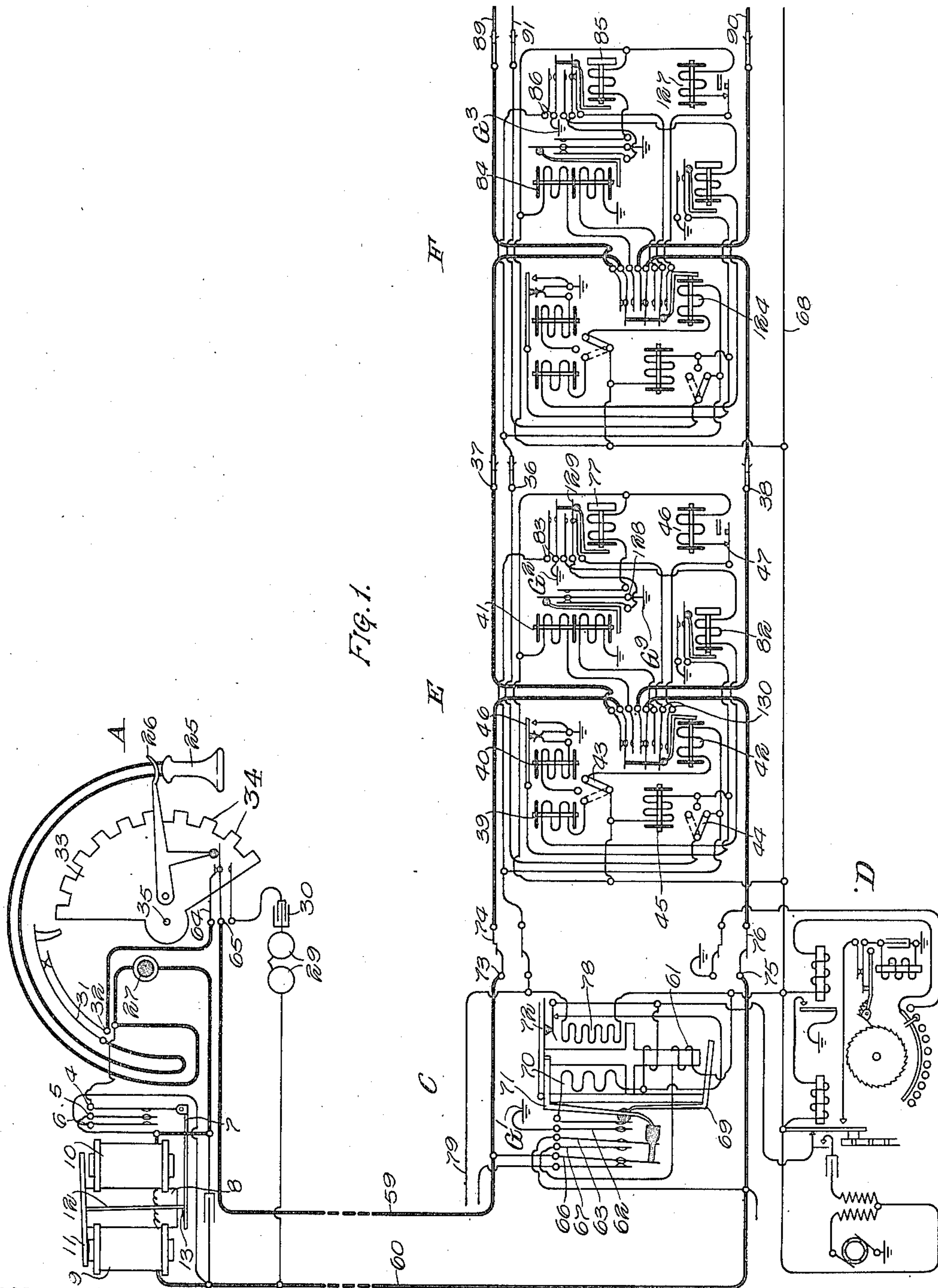


Fig. 1.

WITNESSES
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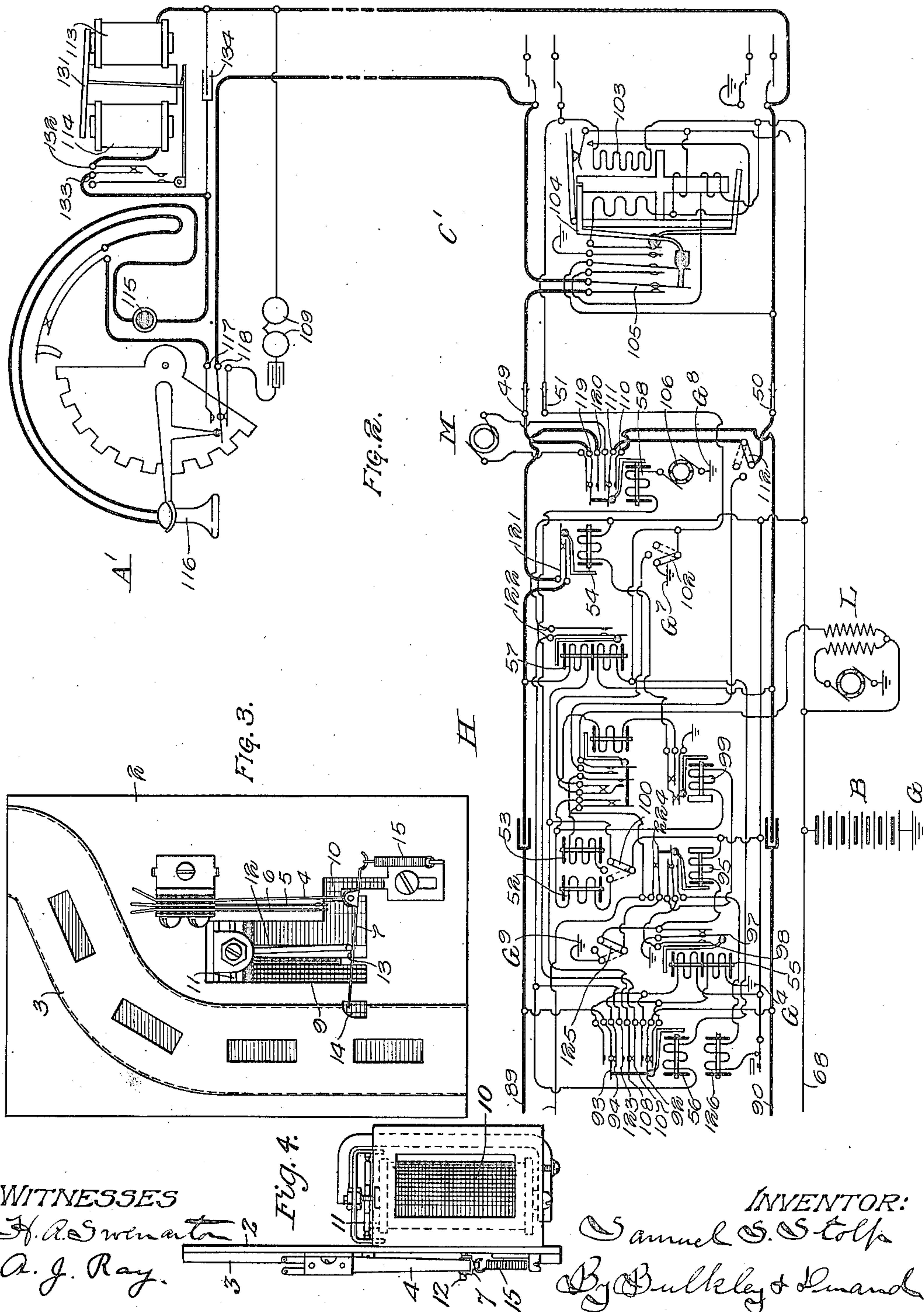
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MEASURED SERVICE TELEPHONE SYSTEM.

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3 SHEETS—SHEET 2.

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WITNESSES

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3 SHEETS—SHEET 3.

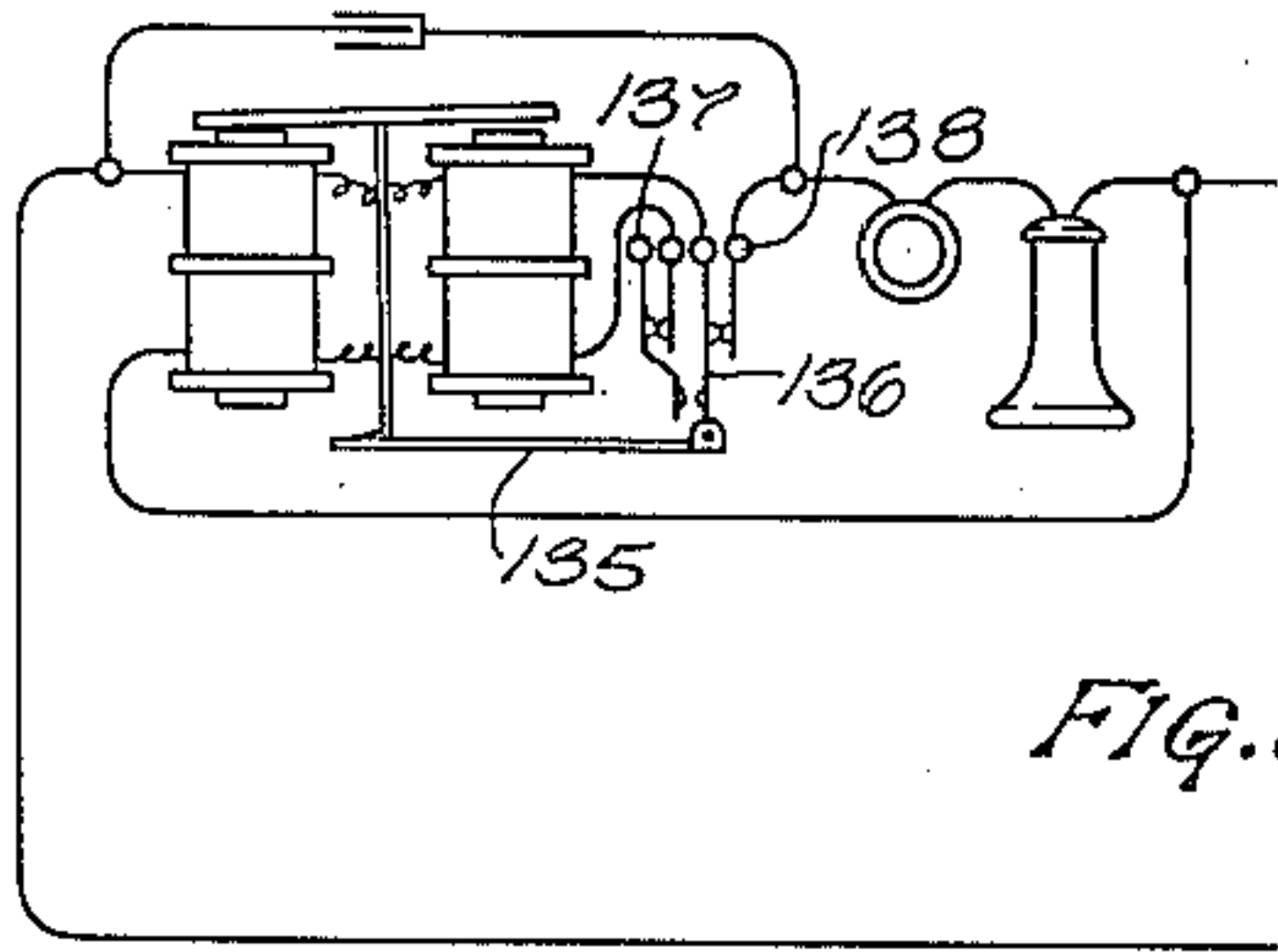


FIG. 5.

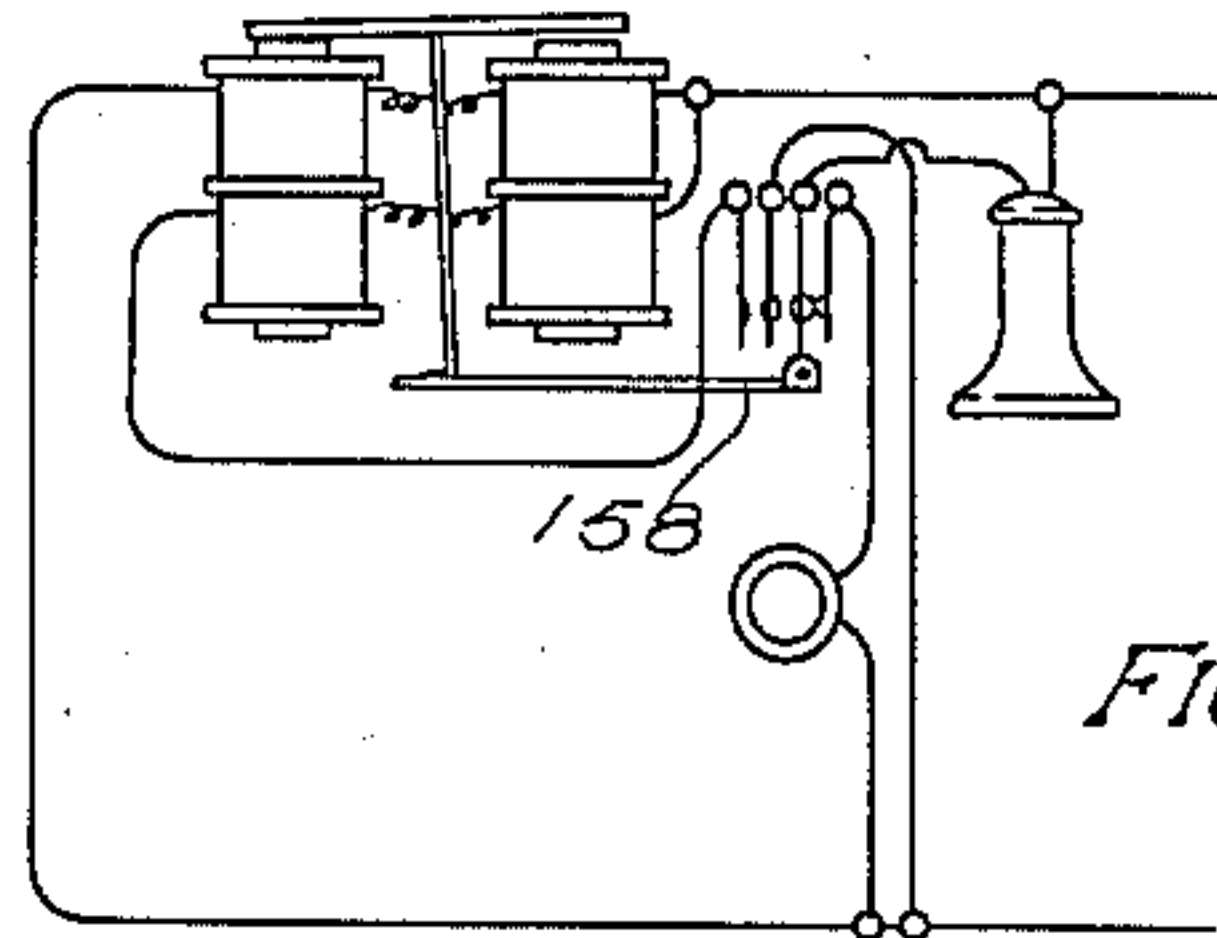


FIG. 6.

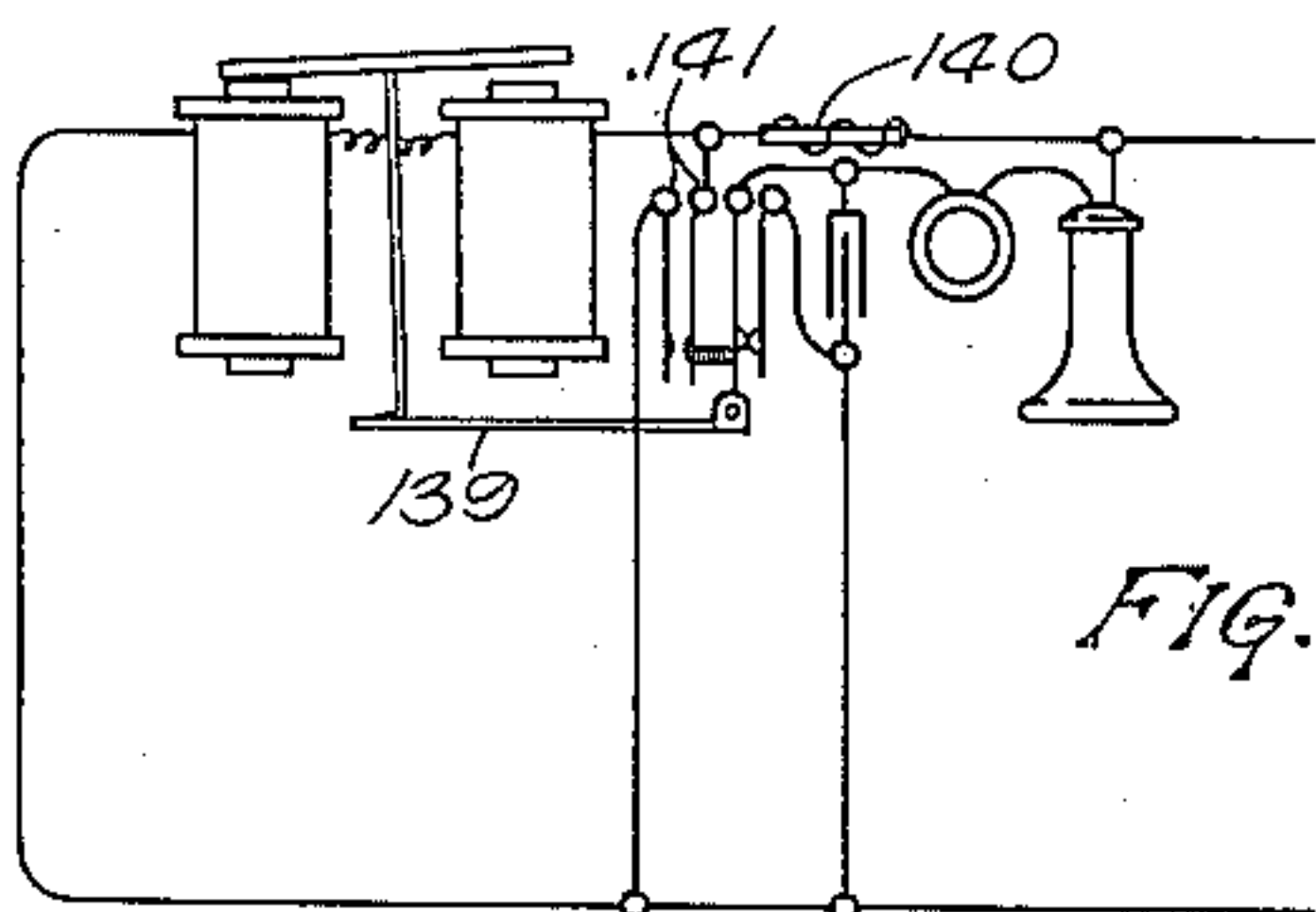


FIG. 7.

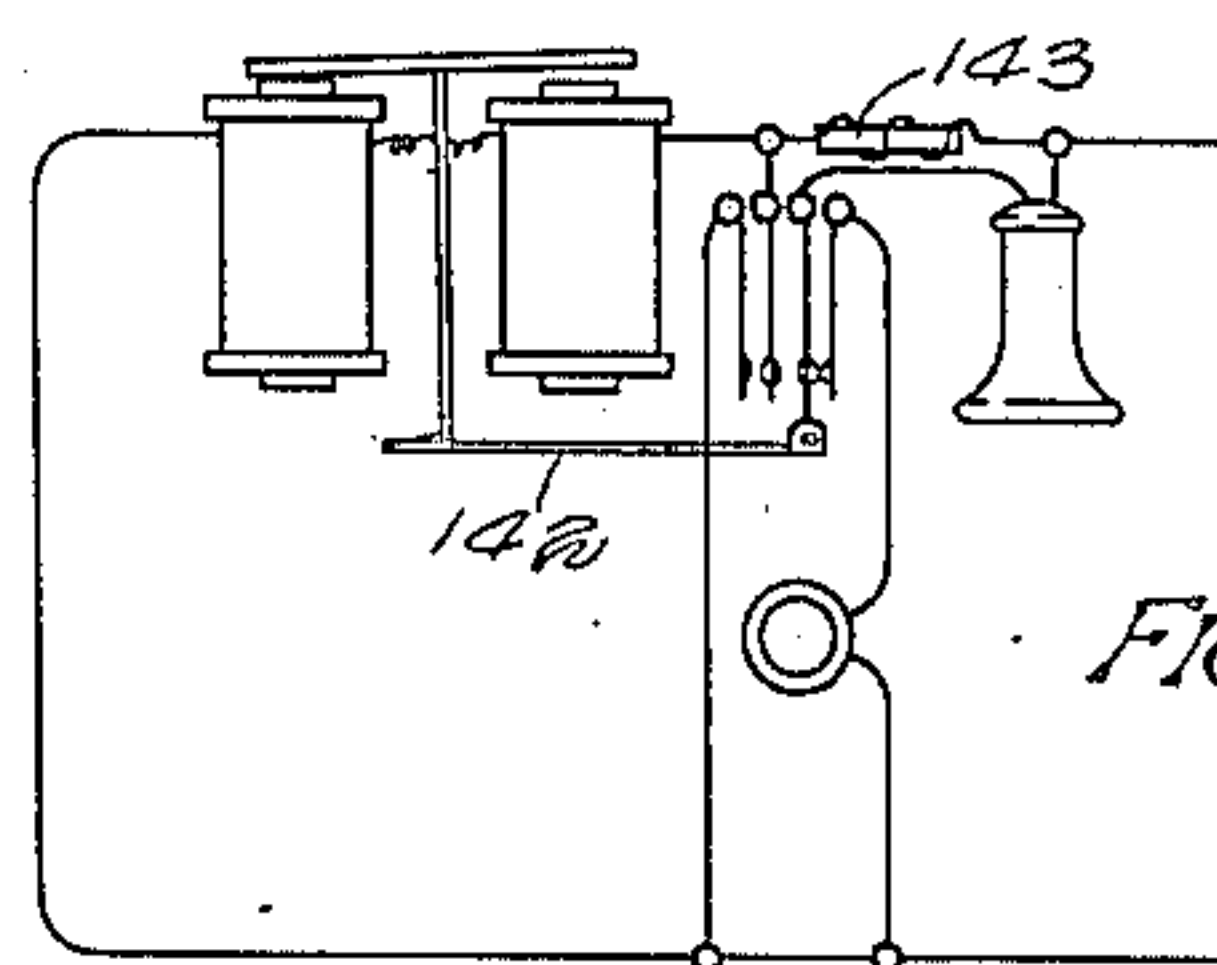


FIG. 8.

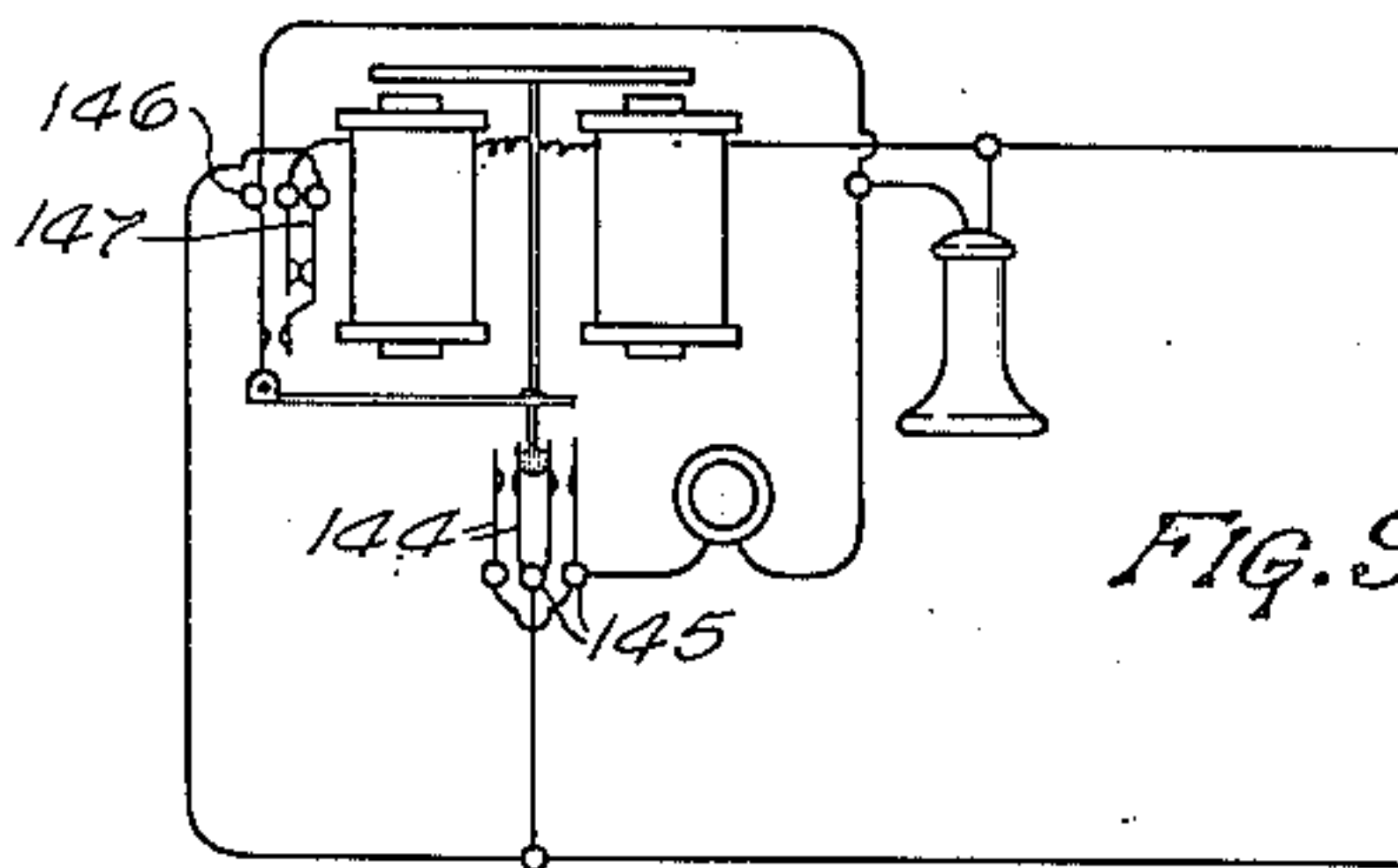


FIG. 9.

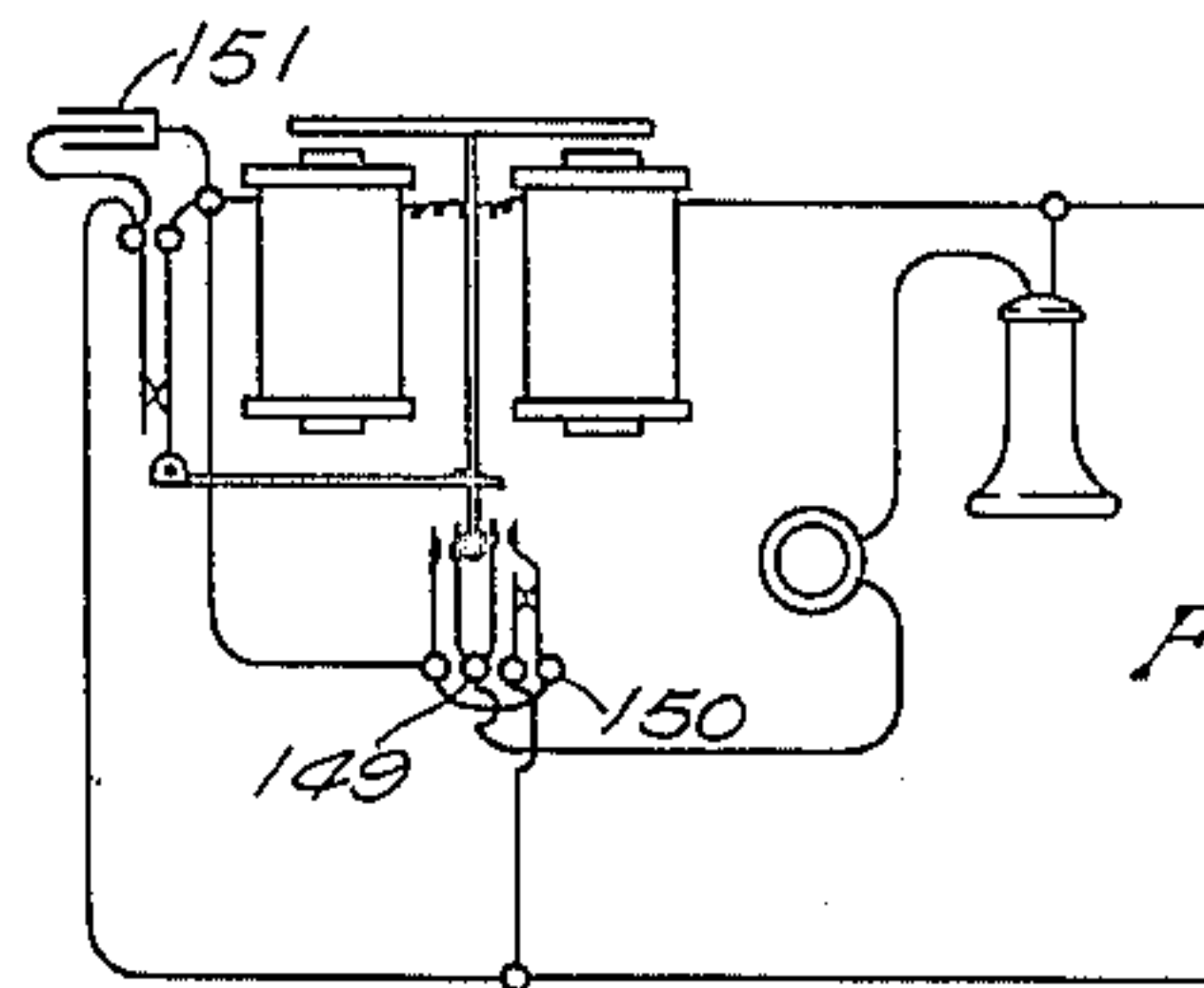


FIG. 10.

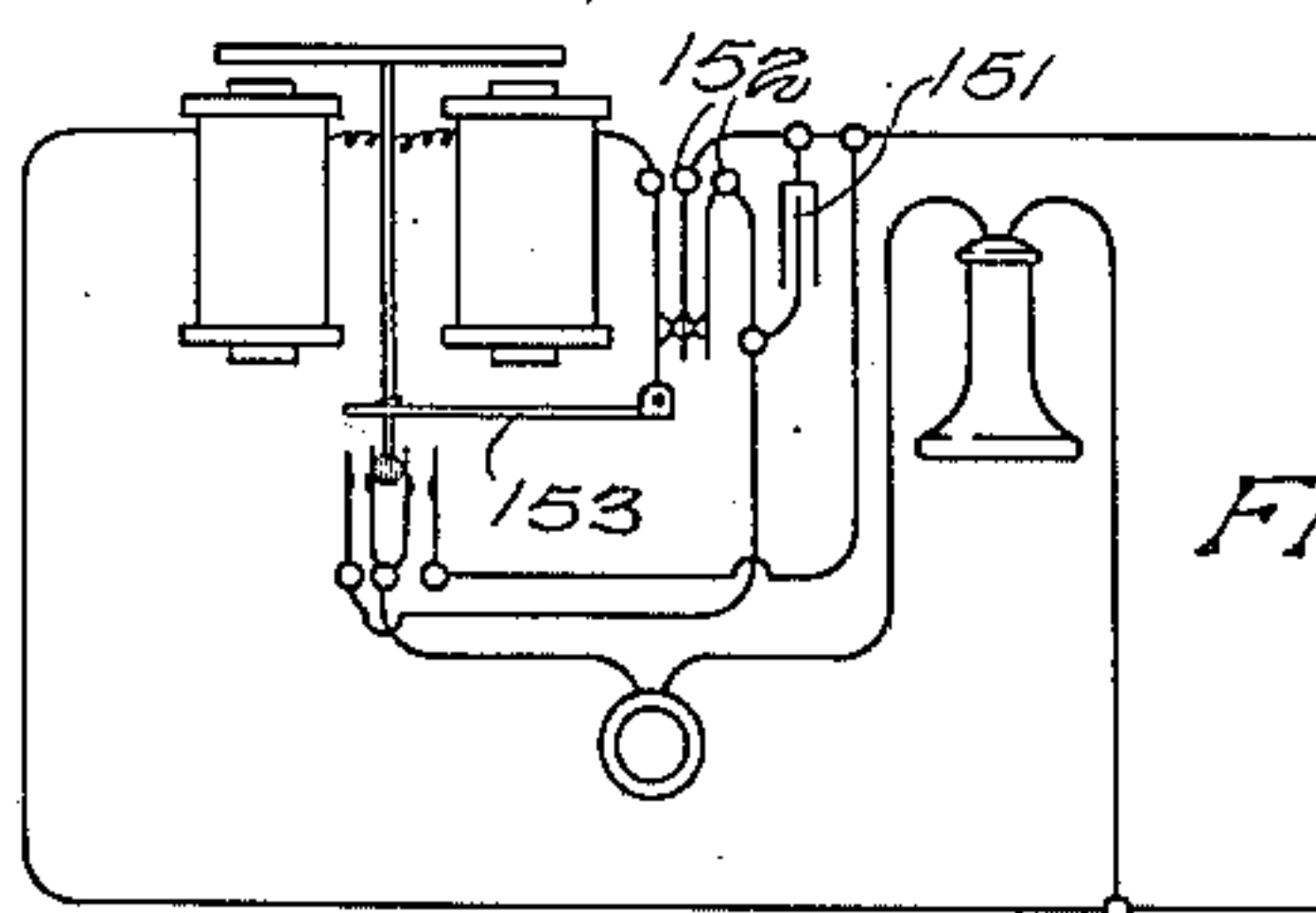


FIG. 11.

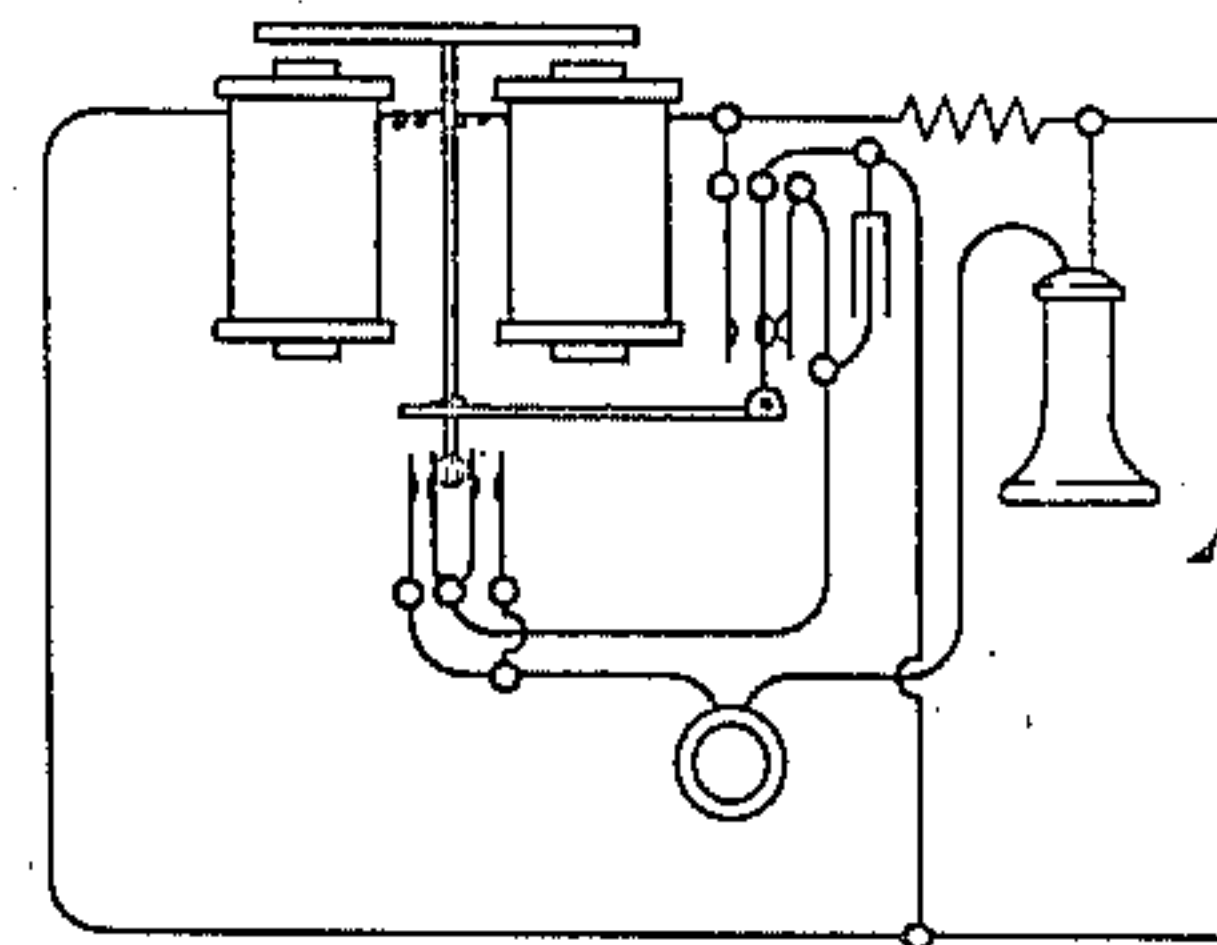


FIG. 12.

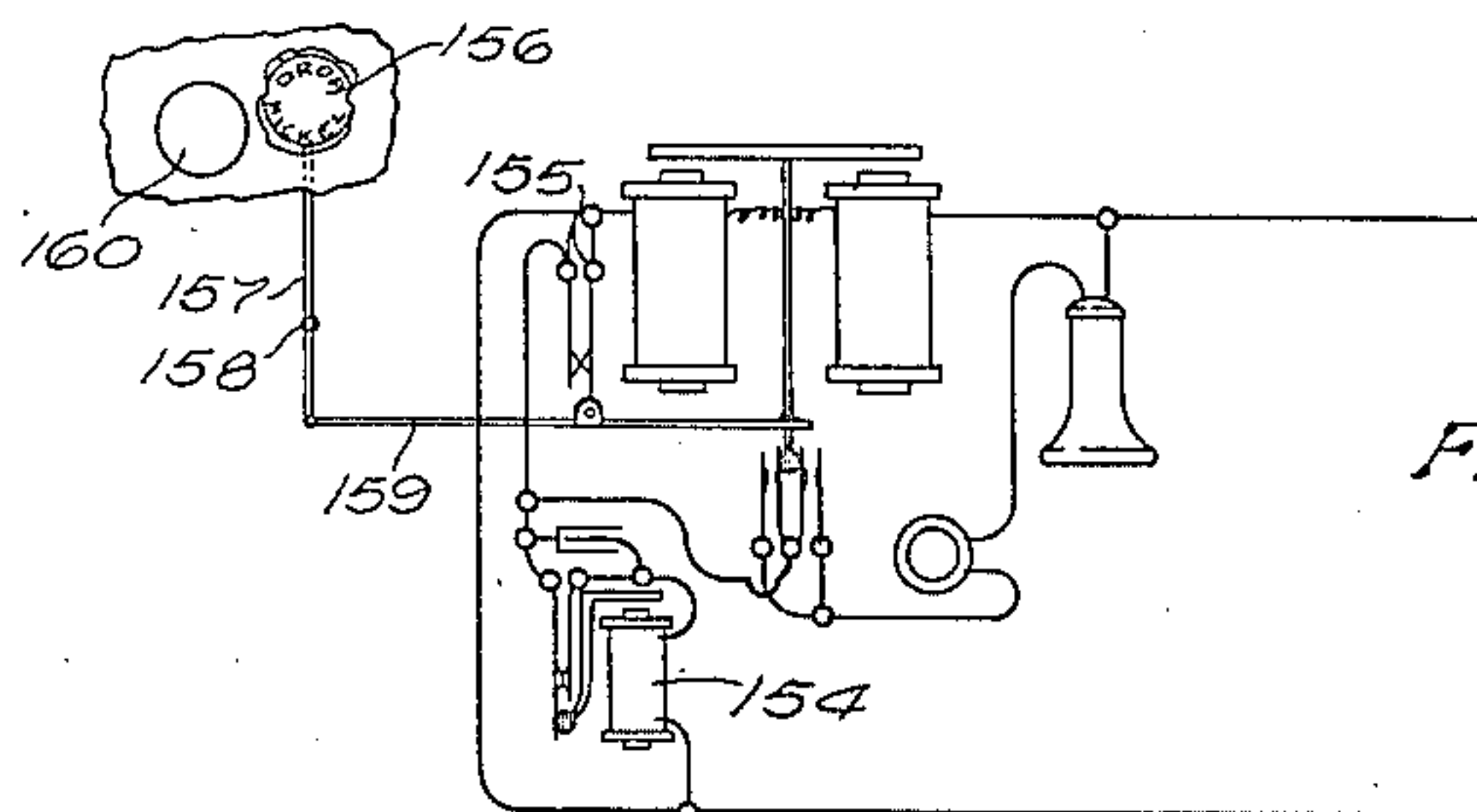


FIG. 13.

WITNESSES

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MEASURED-SERVICE TELEPHONE SYSTEM.

1,214,969.

Specification of Letters Patent.

Patented Feb. 6, 1917.

Application filed February 29, 1912. Serial No. 680,690.

To all whom it may concern:

Be it known that I, SAMUEL S. STOLP, a citizen of the United States of America, and resident of Chicago, Cook county, Illinois, have invented a certain new and useful Improvement in Measured-Service Telephone Systems, of which the following is a specification.

My invention relates to measured service telephone systems, and more particularly to telephone systems in which a connection between two subscribers is set up in whole or in part by automatic means. In such systems, in which it is necessary for the calling subscriber to deposit a coin before the telephone system is rendered operative for talking purposes, various objections have heretofore occurred. In such systems, when the called subscriber responds, the transmitter of the calling subscriber is rendered inoperative until after he operates his measured service device, although the calling subscriber can hear the response of the called subscriber. It has been found that during the interval of time which occurs while the calling subscriber is operating his measured service device, the called subscriber being unable to hear any response, often hangs up his receiver so that no conversation can be had even after the coin is deposited.

An object of my invention is to overcome this objectionable feature. I accomplish this by providing means for indicating to the called subscriber when he responds that a measured service subscriber is calling. Upon hearing this signal the called subscriber will then know that the calling subscriber must first operate his measured service device before he can converse, and he will therefore wait and not hang up his receiver until he has given the calling subscriber sufficient time to accomplish this.

A further advantageous feature of my device is that when the called subscriber knows that a measured service subscriber is calling, he can repeat his number to the calling subscriber and in that way the calling subscriber can be assured that he has the correct number before he operates his measured service device.

These and other objects of my invention will be more readily understood by reference to the accompanying drawings, in which—

Figures 1 and 2 represent a complete connection between a calling subscriber A (Fig. 1) and a called substation A' (Fig. 2) in a system embodying the principles of my invention. In Fig. 1 there is represented an automatic substation A to the line conductors of which there is allotted at the central office an individual or line switch C. At D there is shown a master switch for controlling a group of line switches C. The line switches of this group have common access to a number of trunk lines which lead to first selector switches E. A number of first selectors have common access to a number of second selectors F, which in turn have access to connector switches H (Fig. 2) by means of which connection may be completed with subscribers' lines.

Figs. 3 and 4 are respectively, front and side views of the coin-collecting device with which I have chosen to illustrate my invention, the inclosing case and coin-receiving receptacle being omitted.

Figs. 5 to 13, inclusive, are diagrammatic views showing a number of different ways in which the circuits of the coin-collecting device may be arranged.

I will first describe the construction and method of operation of the coin-collecting device.

In Figs. 3 and 4, 2 is a face plate to the front surface of which there is attached a coin chute 3. Also, upon the front of the plate 2, but insulated therefrom and from each other, there is mounted a group of contact springs 4, 5 and 6. The lower end of the spring 4 carries a swinging arm 7. Back of the plate 2 there is mounted a polarized electromagnet comprising a permanent magnet 8 and two coils 9 and 10. The armature 11 of the electromagnet is provided with a downwardly projecting arm 12. The lower end of the arm 12 is bent forward above the arm 7. When the armature 11 is attracted downward to the left, the lower end of the arm 12 is swung to the right and is brought behind a small lug 13 on the arm 7. If, now, the armature 11 be tipped downward to the right, the end of the arm 12 engages the lug 13 and carries said arm to the left. When the arm 7 is thus moved to the left, its left end projects into an opening 14 in the side of the coin chute, while the spring 4 is forced into en-

gagement with the springs 5 and 6. If a coin be dropped down the chute while the arm 7 is in this position, the coin will strike the end of said arm 7, carrying the lug 13 out of engagement with the arm 12, whereby the springs 4, 5 and 6 are permitted to separate. The spring 15 serves to hold the arm 7 in engagement with the arm 12 until the coin is deposited. After the arm 7 has been released it cannot be drawn over again until the electromagnet has been energized in the reverse direction to bring the arm 12 behind the lug 13 again.

The automatic substations may be of any suitable or approved type. Those with which I have chosen to illustrate my invention, and as illustrated at A in Fig. 1, comprise the usual receiver 25, switch hook 26, transmitter 27, ringer 29 and condenser 30. In addition; the substation A is provided with an automatic calling device which may be of the type shown in British patent to S. G. S. Dicker, No. 29,654 of 1910, being represented herein diagrammatically, however, by the impulse springs 31 and 32 and a toothed impulse wheel 33. The impulse wheel is secured to a shaft 35 to which there is also attached a dial (not shown) provided with finger holes, through the medium of which the impulse wheel may be rotated. As the impulse wheel is returned to normal position by a spring (not shown) after it has been rotated for any digit, each of the teeth 34 which pass the end of the spring 31 forces said spring out of engagement with the spring 32. The number of times these springs are separated depends upon the digit called. Connected to the line of the substation A there is also shown a collecting device like that shown in Fig. 3. The coin-collecting device is represented only diagrammatically in Fig. 1 and the parts are designated by the same reference numerals as in Fig. 3.

The line switch C and the master switch D are of the general type of line and master switches shown in British patent to R. W. James, No. 26,301 of 1906, being of the particular form, however, shown in British patent No. 1,419 of 1910 to T. G. Martin.

The selector E is of the general type of selector switch disclosed in United States Letters Patent No. 815,321; granted March 13, 1906, to Keith, Erickson and Erickson, the circuits being modified, however, in essentially the same manner as shown in British Patent No. 1,419 of 1910 referred to above, so as to operate in a so-called two-wire system. Among other details, the selector E comprises a set of wipers 36, 37 and 38 carried upon a vertically and rotatably movable shaft (not shown). The vertical movement is controlled by the vertical magnet 39 and the rotary movement is con-

trolled by the rotary magnet 40. The usual vertical and rotary line relays are replaced by the double-wound line relay 41, which is connected with the line circuit through the springs of a switching relay 42. The side switch, comprising the wipers 43 and 44, is controlled by the private magnet 45 in a manner well known in the art. Means for restoring the switch to normal position are provided in the release magnet 46. This magnet releases the switch immediately upon energization, rather than by deenergization as shown in the said selector patent. The springs 47 are opened by the switch shaft whenever it is in its lowest position. The private magnet 45 is controlled by the rotary magnet 40 electrically through the medium of the contact point 46, instead of mechanically as shown in the selector patent above referred to.

The selector F is the same as the selector E.

The connector H is of the general type of connector switch disclosed in United States Letters Patent No. 815,176, granted March 13, 1906, to Keith, Erickson and Erickson, but, like the selectors, is modified in order to operate in a two-wire system. Like the selectors, the connector is provided with a shaft (not shown) carrying the wipers 49, 50 and 51 and controlled by the vertical magnet 52 and the rotary magnet 53. The usual side switch is controlled by the private magnet 54 in the usual manner. The line relay 55 is connected with the line conductors through the springs of a reversing relay 56. The connector is provided with a so-called back-bridge relay 57 through which the called substation is provided with talking battery current, and with a ringer relay 58 through the medium of which ringing current may be applied to the called line after connection is completed therewith.

The substation A' and the line switch C' are similar to the substation A and the line switch C, respectively. At M there is shown a ringing current generator and at L a busy signaling machine is represented. For operating the central office apparatus and for furnishing talking current there is provided a battery B having one pole, preferably the positive, grounded at G.

Having given a general description of the apparatus, I will now explain the operations by which one subscriber establishes connection with another in the system shown. Since the structure and mode of operation of the central office apparatus shown herein is in general well known, and is fully described in the publications hereinabove referred to, it is not thought necessary to give a detailed description of the same herein in order to enable a complete understanding of

my invention to be had. It will be assumed in the following description that the number of the called substation A' is 2220. When the calling subscriber moves his receiver, a bridge consisting of the substation transmitter, receiver and the windings of the coin-collecting device is closed across the line conductors 59 and 60. The closure of this bridge across the line completes an energizing circuit through the line winding 61 of the switch C. This circuit extends from ground G' through the springs 62 and 63, line 60, coils 9 and 10 of the coin-collecting device, transmitter 27, receiver 25, impulse springs 31 and 32, springs 64 and 65, line 59, springs 66 and 67 and the winding 61 to the battery lead 68. The current through the coils of the coin-collecting device at this time flows in such a direction as to attract the armature toward the coil 9, as shown in Fig. 1, thereby bringing the end of the arm 12 behind the lug 13 on the arm 7. The energization of the winding 61 serves to attract the armature 69, which operates to close a circuit through the pull-in winding 70. The winding 70, upon energizing, attracts the armature 71 and the plunger arm 72, whereby the line connection is extended through the springs 73 and 74 and 75 and 76 to the first selector E, and the line winding of the switch C is disconnected from the line. When connection is thus extended to the selector and the switch C is cut off, the calling substation thereafter receives current through the line relay 41 of the selector. The relay 41, upon energizing, closes the circuit of the slow-acting relay 77. The relay 77, upon energizing, closes a circuit for the holding winding 78 of the line switch C, and extends a guarding potential over the conductor 79 to the connector private bank contacts of the calling line. The calling subscriber now operates his calling device for the first digit 2, which momentarily separates the sub-station impulse springs 31 and 32 twice. Each time these springs are separated the first selector line relay 41 deenergizes. Since the relay 77 is a relay which is slow to deenergize, its armature does not have time to fall back during the momentary interruption of its circuit by the relay 41. Therefore, each time the relay 71 deenergizes, a circuit is closed through the relay 82 and the vertical magnet 39. The two impulses received by the vertical magnet cause it to raise the shaft wipers 36, 37 and 38 two steps to a position opposite the second row or level of bank contacts. The slow acting relay 82, which is included in the operating circuit of the vertical magnet, closes a circuit through the private magnet 45 and keeps it closed until after the last impulse for the digit is delivered. When it does deenergize, the relay 82 breaks the circuit of the private magnet

45, which in turn deenergizes and permits the side switch to pass to second position. In second position the side switch wiper 43 completes a circuit through the rotary magnet 40. The side switch remains in second position and causes the rotary magnet to operate in a manner similar to that of a buzzer to rotate the wipers step by step over the bank contacts of the second level until the wipers reach the contacts of an idle trunk line, whereupon the side switch passes to third position. The movement of the side switch wiper 43 from second to third position, besides breaking the circuit of the rotary magnet, closes the circuit of the line switching relay 42. This circuit extends from ground G² at the relay 77 through the springs 83, relay 42 and side switch wiper 43 to battery. The relay 42, upon energizing, disconnects the line relay 41 from the line and extends the line connection through the line wipers 37 and 38 to the second selector F, whereupon its line relay 84 becomes energized in the same manner in which the relay 41 was energized when the connection was first extended to the selector E. The relay 84, upon energizing, closes the circuit of the relay 85. The relay 85, upon energizing, completes a circuit extending from ground G³ through the springs 86, private bank contact and private wiper 36 of the selector E, side switch wiper 44, thence through the relay 42 and the holding winding 78 of the line switch C in multiple to battery. This circuit just traced is for the purpose of maintaining the relays 42 and 78 energized after the relay 77 of the selector E is deenergized, which occurs shortly after the relay 41 is disconnected from the line by the relay 42.

The calling subscriber now operates his calling device for the second digit 2, whereupon the second selector F operates in the same manner as explained for the selector E to extend the connection over the trunk conductors 89 and 90 to the connector H (Fig. 2). The line relay 55 of the connector thereupon becomes energized over a circuit extending from ground G⁴ through the lower winding of the relay 55, spring 92 and its back contact, trunk conductor 90, thence over the heavy conductors to and through the substation A and back over the other side of the line through the switches E and F, over the trunk conductor 89, springs 93 and 94 and through the upper winding of the relay 55 to battery. The relay 55, upon energizing, closes the circuit of the slow acting relay 95, which, upon energizing, provides a holding circuit for the relays 124 and 42 of the switches F and E and the winding 78 of the switch C.

The calling subscriber now operates his dial for the third digit 2, momentarily separating the impulse springs 31 and 32 twice,

each time breaking the energizing circuit of the connector line relay 55. Since the relay 95 of the connector is slow acting, it does not have time to deenergize during the momentary deenergization of the relay 55; consequently, the engagement of the springs 97 and 98 completes an energizing circuit through the vertical magnet 52 in series with the private magnet relay 99. The vertical magnet receives two impulses over this circuit and operates to raise the shaft wipers two steps. The private magnet relay 99 operates in the same manner as the private magnet relay 82 of the selector E to close the circuit of the private magnet 54 while the vertical magnet is operating. This circuit is broken shortly after the last impulse is delivered to the vertical magnet, whereupon the private magnet deenergizes and permits the side switch to pass to second position. The movement of the side switch wiper 100 from first to second position transfers the battery connection from the vertical magnet 52 to the rotary magnet 53.

The operation of the substation calling device for the last digit breaks the energizing circuit of the relay 55 ten times. Each time the relay 55 deenergizes, it completes a circuit through the rotary magnet 53 and the relay 99. The rotary magnet 53 receives ten impulses over this circuit and operates to rotate the wipers ten steps onto the contacts of line No. 2220. The private magnet relay 99 operates in the same manner as for the previous digit to cause the private magnet to cause the side switch to pass to third position after the last impulse for the digit is delivered, whereby connection is completed between the calling and the called lines. The side switch wiper 102 (in third position) extends a guarding potential from ground G^7 through the private wiper 51 to the connector private bank contacts of the called line, and also provides an energizing circuit for the cut-off winding 103 of the line switch C' . The winding 103, upon energizing, attracts the armature 104, which operates to disconnect the switch C' from the called line, and to close the contact 105 in the talking circuit. When the side switch wiper 100 of the connector reaches third position, the energizing circuit is established for the ringer relay 58. This circuit extends from ground G^8 through the interrupter 106, relay 58, springs 107 and 108 and the side switch wiper 100 to the battery lead 68. Since this circuit includes the interrupter 106, the relay 58 is energized only intermittently. Each time the relay 58 is energized it operates to disconnect the calling line from the called line, and to bridge the generator M across the called line to ring the bell 109. When the called subscriber removes his receiver, or as soon there-

after as the relay 58 deenergizes, if it happens to be energized at the time, the called substation is provided with talking battery current from the central office over a circuit extending from ground G^7 through the side switch wiper 102, lower winding of the relay 57, ringer relay springs 110 and 111, side switch wiper 112, shaft wiper 50, coils 113 and 114 of the coin-collecting device, transmitter 115, receiver 116, hook switch springs 117 and 118, shaft wiper 49, ringer relay springs 119 and 120, private magnet springs 121, upper winding of the back-bridge relay 57 and the side switch wiper 100 to the battery lead 68. The current through the coils 113 and 114 of the coin-collecting device of the substation A' is in such direction at this time as to attract the armature toward the coil 113. When the connector back-bridge relay 57 is energized by the talking current, it operates to close the circuit through the relay 56. This circuit extends from ground G^7 through the side switch wiper 102, relay 56 and springs 122 to the battery lead 68. The relay 56, upon energizing, operates to break the circuit of the ringer relay 58 at the springs 107 and 108, and to complete a locking circuit for itself through the springs 108 and 123 and the side switch wiper 100. When the relay 56 is energized it also operates to shift the springs 92 and 93 out of engagement with their back contacts and into contact with their front contacts. By this operation the connections between the windings of the relay 55 and the trunk conductors 89 and 90 are interchanged. By this shifting of the connections of the relay 55 the current in the calling line is reversed. This reversal of current causes the magnet of the coin-collecting device to attract its armature down toward the coil 10. When the armature is attracted in this direction, its arm 12 engages the lug 13 and pulls the arm 7 over to the left, causing its left end to project into the coin chute, and also closing the springs 4, 5 and 6. The engagement of the springs 4 and 5 short-circuits the transmitter 27 to render it inoperative. The engagement of the springs 5 and 6 short-circuits the coils 9 and 10, which thereupon allow the armature to fall back until the springs 5 and 6 are opened, when it immediately pulls up again. In other words, upon the reversal of current in the calling line the magnet of the coin-collecting device begins to operate as a buzzer and continues to do so as long as the current remains reversed and the arm 7 remains locked with the arm 12. This buzzing of the magnet of the coin-collecting device produces a buzzing in the receiver of the called subscriber, which notifies him that it is a pay-station line that is calling and that he should give the calling

subscriber full information that he may know that he has obtained connection with the proper line before he deposits a coin. While the magnet is thus buzzing, the calling subscriber can hear the called subscriber answer, but cannot talk to him on account of the short-circuiting of the transmitter 27 through the springs 5 and 4. In order to render the calling telephone operative for talking the calling subscriber must deposit a coin in the coin-collecting device, which, upon passing down the chute, strikes the arm 7 and trips it off from the arm 12, thereby allowing the springs 4, 5 and 6 to restore to normal position. It will be understood that while the magnet of the coin-collector is buzzing, its armature never falls back far enough to completely withdraw the arm 7 from the coin chute, so that there is no possibility of the coin failing to trip said arm 7 from the arm 12.

After a conversation is completed the connection is released by the hanging up of the receiver at the calling substation in the following manner: During the time the connection is being maintained the relays 124 and 42 of the selectors F and E and the winding 78 of the switch C are maintained energized over a circuit extending from ground on the spring 97 of the line relay 55 at the connector H through the front contact thereof, side switch wiper 125, springs 224, conductor 91, thence through the relays 124 and 42 over circuits similar to that formerly traced for the relay 42 of the selector E and through the winding 78 to the battery lead 68. When the calling subscriber hangs up his receiver, the circuit of the connector line relay 55 is broken. The relay 55, upon deenergizing, breaks the circuits of the relays 124 and 42 of the selectors F and E and the winding 78 of the switch C, as well as that of the connector release relay 95. The relay 95, upon deenergizing, closes the circuit of the connector release magnet 126. The relays 124 and 42, upon deenergizing, close the circuits of the release magnets 127 and 46. The circuit of the magnet 127 is similar to that of the magnet 46, which extends from ground G⁹ through the spring 128 and its back contact, spring 129 and its back contact, springs 130 and 47 and the magnet 46 to the battery lead. The magnets 126, 127 and 46, upon energizing, immediately restore their respective switches to normal position. The switch C is restored upon the deenergization of its holding winding 78.

It will be seen that the circuit arrangements of the coin-collecting device shown in Fig. 2 are slightly different from that shown in Fig. 1. In Fig. 1 the coin-collector is caused to buzz by short-circuiting itself. In Fig. 2, when the armature 131 is attracted toward the coil 114, the springs 132

and 133 are separated and therefore this magnet is an open circuiting buzzer. During the time the springs 133 and 132 are opened, the receiver circuit is maintained closed by the condenser 134.

In Figs. 5 to 13, inclusive, a number of additional arrangements of the circuit connections of the substations and coin collectors are shown. In some of these drawings the springs which are controlled by the polarized magnet are shown at the right of the magnet, and in other figures at the left. This difference is only for convenience of illustration, it being understood that the magnet operates the horizontal arm only when the current in the calling line is reversed upon the response of the called subscriber.

The circuits shown in Fig. 5 are essentially the same as those shown in Fig. 2, with the exception that there is a second winding upon the coils of the polarized magnet. As the arm 135 moves to the left the spring 136 engages the spring 137 for an instant before it disengages the spring 138, so that for an instant the two windings of the magnet are connected in series, but in opposition, so as to cause the magnet to deenergize faster.

In Figs. 1, 2 and 5 it will be seen that the magnet of the coin-collecting device is energized in series with the transmitter and receiver. In Figs. 6 to 11, inclusive, the coin-collecting magnet is energized in multiple with the transmitter and receiver. In Fig. 6, when the arm 158 is moved to the left it opens the transmitter circuit, bridges the receiver directly across the line and shunts the energizing windings of the coin-collector magnet by a pair of opposing windings so as to cause it to deenergize and buzz.

In Fig. 7, the magnet is caused to buzz by short-circuiting itself whenever the arm 139 is pulled to the left, and at the same time a condenser is inserted in the transmitter and receiver circuit to render the transmitter inoperative. The impedance coil 140 prevents the complete short-circuiting of the receiver and transmitter when the springs 141 are closed, so that the receiver may remain operative.

Fig. 8 is essentially the same as Fig. 7, except that when the arm 142 moves to the left the transmitter circuit is completely opened and the receiver is placed in direct shunt with the impedance coil 143.

In Figs. 6, 7 and 8 the talking circuit and the magnets of the coin-collector are bridged across the line simultaneously upon the removal of the receiver. In the remaining figures there is provided an additional group of springs through the medium of which the talking circuit is not bridged across the line until the magnet of the coin-collector is energized. For instance, in

Fig. 9, when the receiver is removed from the switch hook, the magnet of the coin collector receives all the line current and is not shunted by the talking circuit until the armature has pulled over far enough to close the springs 144. When the current in the calling line is reversed upon the response of the called subscriber, the talking circuit is maintained by the springs 145. When the magnet circuit is open while it is buzzing, the receiver circuit is maintained through the springs 146 and 147 and the transmitter is short-circuited.

Fig. 10 is similar to Fig. 9, except that while the magnet circuit is open the receiver circuit is maintained through the springs 149 and 150 and the condenser 151.

In Fig. 11 the condenser 151 is inserted in the talking circuit by the separation of the springs 152 when the arm 153 is moved to the left.

Fig. 12 is practically the same as Fig. 11, with the exception that the magnet of the coin-collector buzzes by short-circuiting itself instead of by opening its energizing circuit.

In Fig. 13 there is provided an auxiliary buzzer 154 for indicating to the called subscriber that the calling substation is a pay station. When the current is reversed in the line by the response of the called subscriber, the magnet of the coin-collector does not buzz, but simply pulls over and separates the springs 155, whereby a short-circuit is opened around the buzzer 154 and said buzzer continues to operate until a coin is deposited to permit the springs 155 to be closed. If desired, a condenser may be bridged across the buzzer springs as shown, so that the receiver circuit is not interrupted when said springs are opened. I have also shown in Fig. 13 a visual signal for indicating to the calling subscriber when he should deposit a coin. This signal comprises a target 156, which is secured to the end of the rod 157, which is pivoted at the point 158 and secured at its lower end to the arm 159. When the arm 159 is pulled over to the right, upon the response of the called subscriber, to separate the springs 155 to render the calling telephone inoperative, the target 156 comes behind the opening 160 in the wall of the coin box where it may be seen by the subscriber. When the coin is deposited and trips the arm 157 the target retires from sight.

While I have chosen to illustrate my invention in connection with one particular type of telephone system, and have shown various modified forms which my invention may assume, it is to be understood that I do not consider that my invention is limited for use in connection with any particular type of telephone system as it may be used to advantage with many other systems in

which manual means are employed in whole or in part for extending a connection between two subscribers' lines.

What I claim as my invention is:—

1. In a telephone system, calling and called subscribers' lines, means for extending a connection between two of said lines, a measured service device upon certain of said lines, an operating magnet therefor, and means for operating said magnet as a buzzer to transmit a signal to the called subscriber to indicate to said subscriber that the subscriber calling is on a measured service line.

2. In a telephone system, a telephone line, a measured service device upon said line, an operating magnet therefor, and means for operating said magnet as a buzzer for transmitting a signal over said line.

3. In a telephone system, a measured service device, an operating magnet therefor, and means for operating said magnet as a buzzer to transmit a signal.

4. In a telephone system, calling and called subscribers' lines, means for extending a connection between any two of said lines, a coin-controlled device on certain of said lines, and means at said coin-controlled device for automatically indicating to the called subscriber when a subscriber upon a coin-controlled line is calling.

5. In a telephone system, calling and called subscribers' lines, means for extending a connection between any two of said lines, a coin-controlled device on certain of said lines, and means at said coin-controlled device for giving a signal upon the response of the called subscriber to indicate that the subscriber calling is on a coin-controlled line.

6. In a telephone system, calling and called subscribers' lines, means for extending a connection between two of said lines, a coin-controlled device on certain of said lines, an operating magnet therefor, and means controlled by said magnet for giving a signal to the called subscriber to indicate to said subscriber that the calling subscriber is on a coin-controlled line.

7. In a telephone system, calling and called subscribers' lines, means for extending a connection between two of said lines, a coin-controlled device upon certain of said lines, an operating magnet therefor, and means for operating said magnet as a buzzer to transmit a signal to the called subscriber to indicate to said subscriber that the subscriber calling is on a coin-controlled line.

8. In a telephone system, a telephone line, a coin-controlled device upon said line, an operating magnet therefor, means controlled by said magnet for transmitting a signal over said line, and means for operating said first means until stopped by said device.

9. In a telephone system, a telephone line, a coin-controlled device upon said line, an

operating magnet therefor, and means for operating said magnet as a buzzer for transmitting a signal over said line.

10. In a telephone system, a coin-controlled device, an operating magnet therefor, and means for operating said magnet as a buzzer to transmit a signal.

11. In a telephone system, a calling and a called subscriber's line, means for establishing a connection between said lines, and a buzzer at the calling substation adapted to be started in operation by a reversal of current in said line upon the response of the called subscriber.

12. In a telephone system, a calling and a called subscriber's line, means for establishing a connection between said lines, a measured service device upon the calling line, an operating magnet therefor, means controlled by said magnet for transmitting a signal over said lines, means controlled upon the response of the called subscriber for starting said signal in operation, and means for stopping said signal by operating said measured service device.

13. In a telephone system, a calling and a called subscriber's line, means for establishing a connection between said lines, a coin-controlled device upon the calling line, an operating magnet therefor, means controlled by said magnet for transmitting a signal over said lines, and means for automatically starting said signal in operation upon the response of the called subscriber.

14. In a telephone system, a calling and a called subscriber's line, means for establishing a connection between said lines, a coin-controlled device upon the calling line, an operating magnet therefor, means controlled by said magnet for transmitting a signal over said lines, means for starting said signal in operation upon the response of the called subscriber, and means for stopping said signal by depositing a coin in said device.

15. In a telephone system, a calling and a called subscriber's line, means for establishing a connection between said lines, a coin-controlled device upon said calling line, an operating magnet therefor, means controlled by said magnet for transmitting a signal over said line, means for reversing the current in said calling line upon the response of the called subscriber, and means operated by said reversal of current for setting said signal in operation.

16. In a telephone system, a calling and a called subscriber's line, means for establishing a connection between said lines, a coin-controlled device upon said calling line, an operating magnet therefor, means controlled by said magnet for transmitting a signal over said line, means for reversing the current in said calling line upon the response of the called subscriber, means oper-

ated by said reversal of current for setting said signal in operation, and means for rendering said signal again inoperative by depositing a coin in said device.

17. In a telephone system, a calling and a called subscriber's line, means for establishing a connection between said lines, a measured service device upon the calling line, means normally rendering the transmitter of the calling subscriber inoperative, a signaling means for operating said signal upon the response of the called subscriber to indicate that a measured service line is calling, and means controlled by operating said measured service device for rendering said transmitter operative.

18. In a telephone system, a calling and a called subscriber's line, means for establishing a connection between said lines, a measured service device on the calling line, an operating magnet therefor adapted to transmit a signal over the called line, means for rendering the transmitter on said calling line normally inoperative, means controlled upon the response of the called subscriber for starting said signal in operation, and means controlled by the operation of said measured service device for rendering said signal inoperative and for rendering said transmitter operative.

19. In a telephone system, a calling subscriber's line and a called subscriber's line, means for connecting said lines, and means for assessing toll against the calling line and for signaling the called line as long as the calling subscriber's toll is not assessed.

20. In a telephone system, a calling subscriber's line and a called subscriber's line, means for connecting said lines, and means for assessing toll against the calling line and for signaling the called line as long as the calling subscriber's toll is not assessed, the signaling action of said second means initiated upon the response of the called subscriber.

21. In a telephone system, a calling subscriber's line and a called subscriber's line, means for connecting said lines, and means for assessing toll against the calling line and for signaling the called line as long as the calling subscriber's toll is not assessed, the signaling action of said second means initiated upon the response of the called subscriber, said signaling and assessing means having equipment in common.

22. In a telephone system, a calling subscriber's line and a called subscriber's line, means for connecting said lines, and means for assessing toll against the calling line and for signaling the called line as long as the calling subscriber's toll is not assessed, the signaling action of said second means initiated upon the response of the called subscriber, said signaling and assessing means having a controlling magnet in common.

23. In a telephone system, a calling subscriber's line and a called subscriber's line, means for connecting said lines, and means for assessing toll against the calling line
5 and for signaling the called line as long as the calling subscriber's toll is not assessed, the signaling action of said second means initiated upon the response of the called subscriber, said signaling and assessing means

having equipment in common, said equipment individual to the calling line. 10

Signed by me at Chicago, Cook county, Illinois, this 20th day of February, 1912.

SAMUEL S. STOLP.

Witnesses:

ARTHUR J. RAY,
ALBERT ANDERSEN.