B. D. WILLIS.

LOCK-OUT PARTY LINE TELEPHONE SYSTEM.

APPLICATION FILED FEB. 29, 1912.

1,166,645.

Patented Jan. 4, 1916.

2 SHEETS—SHEET 1.

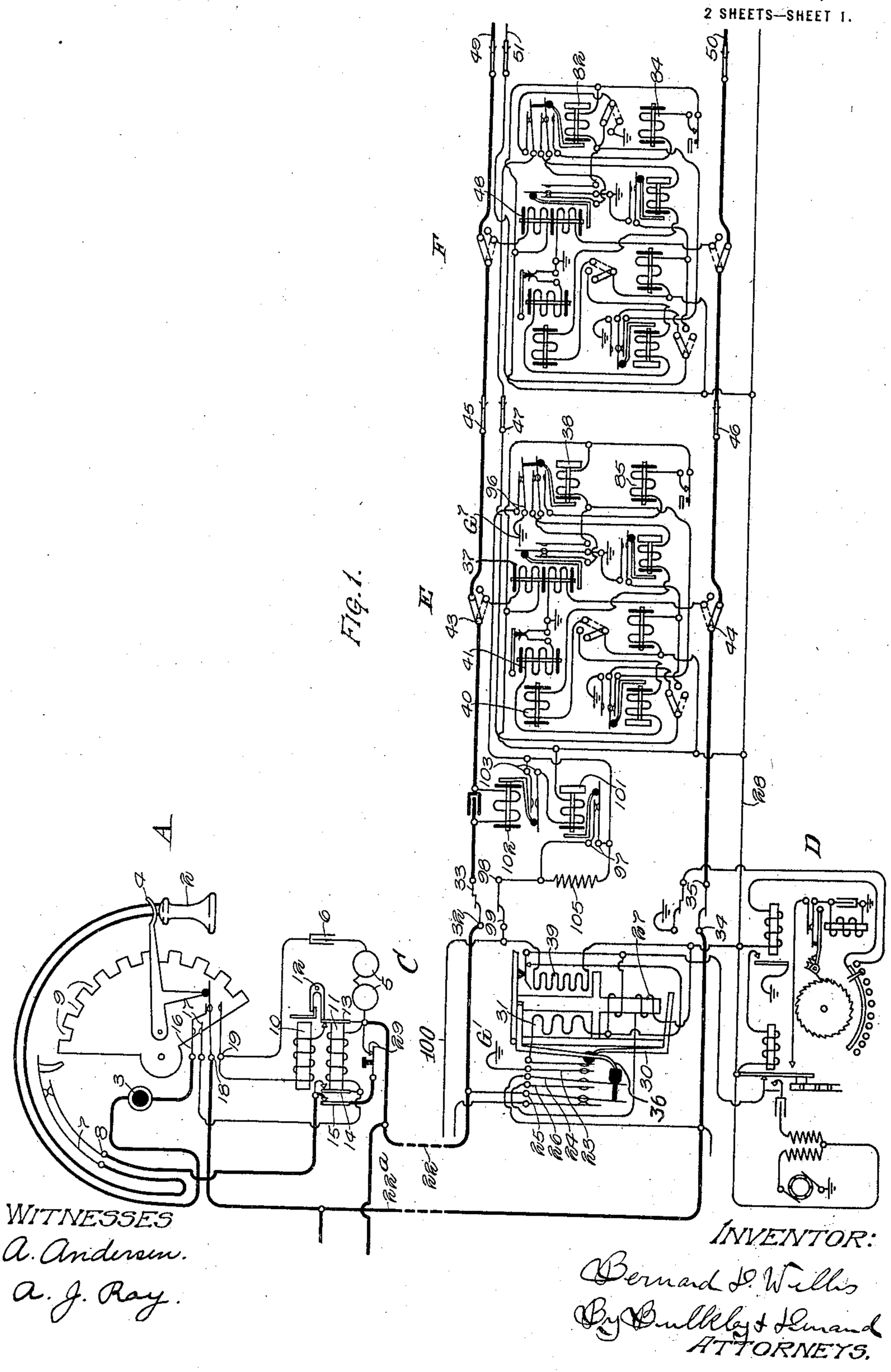

FIG. 1.

WITNESSES

A. Anderson.

A. J. Ray.

INVENTOR:

Bernard D. Willis

By Bulkley & Elmand

ATTORNEYS.

B. D. WILLIS.

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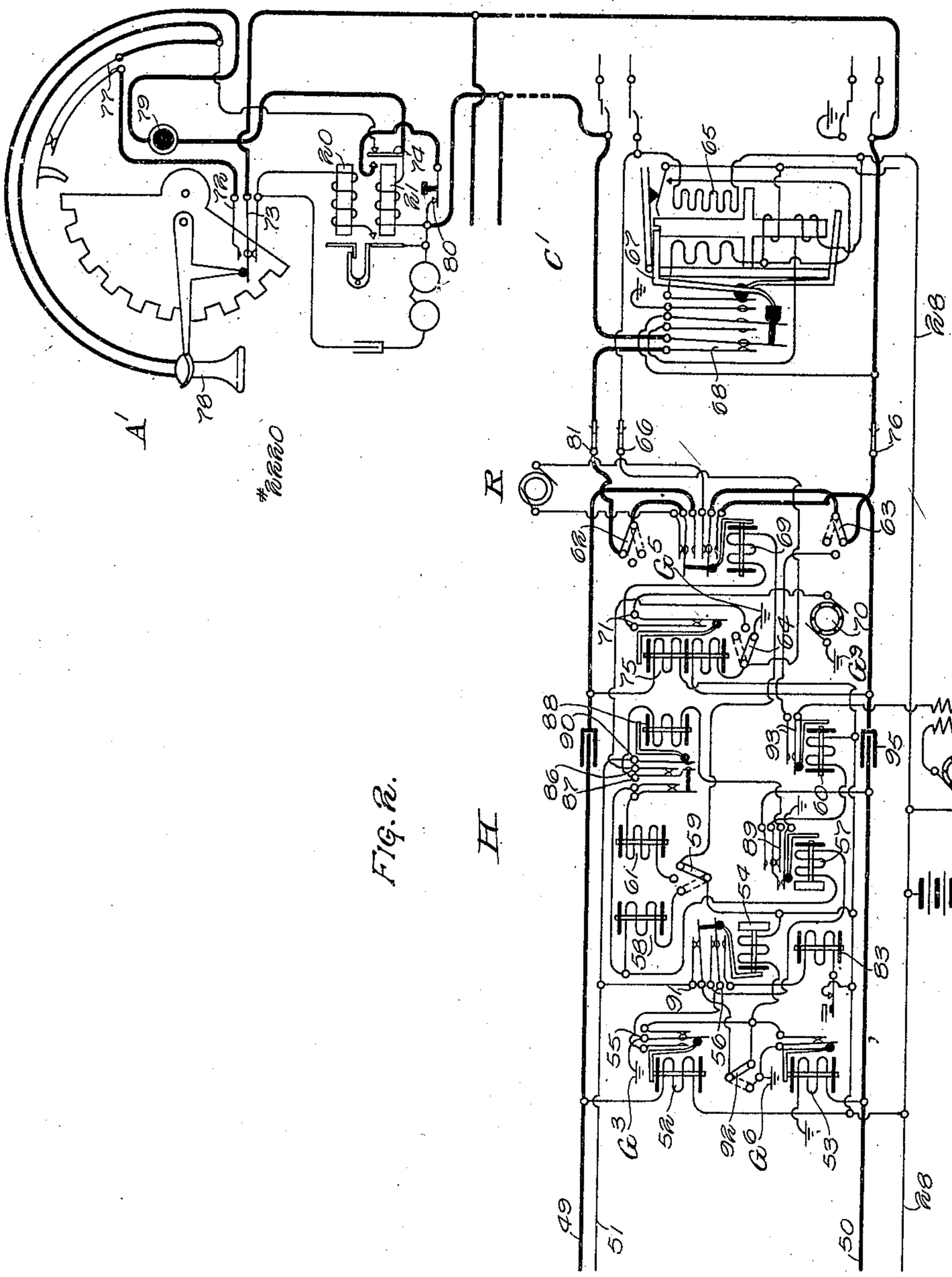

FIG. 2.

WITNESSES

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UNITED STATES PATENT OFFICE.

BERNARD D. WILLIS, OF CHICAGO, ILLINOIS, ASSIGNOR TO AUTOMATIC ELECTRIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

LOCK-OUT PARTY-LINE TELEPHONE SYSTEM.

1,166,645. Specification of Letters Patent. Patented Jan. 4, 1916.

Application filed February 29, 1912. Serial No. 680,576.

To all whom it may concern:

Be it known that I, BERNARD D. WILLIS, a citizen of the United States of America, and resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Lock-Out Party-Line Telephone Systems, of which the following is a specification.

My invention relates to party-line telephone systems, and more particularly to an improved lock-out device by which means are provided for preventing a second subscriber from coming in upon the line when one subscriber upon the line is using the same.

My invention is particularly adapted for use in connection with automatic or semi-automatic telephone systems in which an automatic calling device is provided at the subscribers' stations.

Among the specific objects of my invention are to provide a relay which, upon energizing, bridges the talking circuit across the line. This relay is marginal in operation, and will not energize if the talking circuit of any other substation is bridged across the line. In combination with this relay I provide an electromagnet which is energized when the subscriber replaces his receiver upon the hook, which magnet operates to return the operated parts to their normal positions. These and other objects of my invention will be more readily and clearly understood by reference to the accompanying drawings, in which—

Figures 1 and 2 taken together show a complete connection between a calling substation A and a called substation A′ in a telephone system embodying the principles of my invention.

The telephone system shown herein is an automatic system of the well-known type in which the connections are established between the calling and called lines through the medium of individual preselector or line switches, first and second selector switches and connectors. The connection shown is established through the medium of the line switch C, first selector E, second selector F and the connector H. At D there is shown the usual master switch for controlling the line switch C. At B (Fig. 2) there is shown a central office battery for supplying current for operating the switches and for talking purposes. At R a ringing current generator is shown and at S a busy signaling machine is represented.

The system shown herein is also a party-line system—that is, there may be connected to each line a plurality of substations similar to the substations A and A′. Although only one station is shown upon each line herein, branches are shown leading over from the line conductors to which other stations may be connected in the same manner as those shown. Any desired arrangement may be employed in order that the different stations on the same line may be signaled selectively. Very satisfactory results are obtained by the following well-known arrangement, in which the bells of the different substations are tuned or otherwise adapted to respond to only a certain kind of ringing current. At the central office means are provided for producing as many different kinds of ringing current as there are substations upon each line. Each line is accessible through as many different groups of connector switches as there are substations on it, and each group of connectors is supplied with ringing current of a different character. Thus, to signal any particular substation on a line it is necessary to call this line through the medium of a connector in a group which is supplied with ringing current of the proper character to operate the bells at the substation desired. Each of the different groups of connectors which have access to the same line may be accessible through a different level of the second selectors, so that the numbers of the different substations on each line may be different, and the proper group of connectors will be automatically selected when the number of any substation is called.

The substations may be of any suitable common battery two-wire automatic type. The ones with which I have elected to illustrate my invention and as shown at A in Fig. 1 comprise the usual receiver 2, transmitter 3, switch hook 4, ringer 5 and condenser 6. Being an automatic substation it must also be provided with an automatic calling device. This calling device may be of the type shown in British patent to S. G. S. Dicker, No. 29,654 of 1910, but is herein represented diagrammatically by a pair of impulse springs 7 and 8 and the toothed impulse wheel 9, which latter may be controlled by the subscriber through the

medium of a dial (not shown), which dial is provided with finger holes in such a manner that it may be operated to cause the springs 7 and 8 to be separated momentarily a number of times, corresponding to the respective digits of the number to be called. With each substation there are also associated two relays 10 and 11. These relays are interlocking—that is, they are so arranged that when the relay 11 becomes energized its contact springs become locked in their operated positions and cannot return to normal position until the relay 10 has been energized. Any suitable interlocking means may be used in connection with these relays. As shown herein, this means comprises a U-shaped lever 12 which, when the relay 11 is energized, drops down behind the armature 13 and will not permit said armature to restore to its normal position until after the relay 10 is energized to lift the lower end of the lever 12 above the armature 13. It will be understood, of course, that the representation of the relay 11 is only diagrammatic and that the armatures 14 and 15 remained locked in their energized positions along with the armature 13. The switch hook springs 16, 17 and 18 are so arranged that as the switch hook rises upon the removal of the receiver the spring 18, after disengaging the spring 19, engages the spring 16 and then forces the spring 16 out of engagement with the spring 17. It will thus be seen that during the time the switch hook is rising, there is an instant when the springs 16, 17 and 18 are all in contact at the same time. The substation A′ (Fig. 2) is in all respects the same as the substation A except that its switch hook controls a simple make-and-break contact. The relays 20 and 21 are similar to the relays 10 and 11 shown in Fig. 1, the circuit connections being somewhat different, as will be pointed out hereinafter. If desired, the relay 21 may be made sluggish to pull up in any one of a number of known manners.

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

The selectors E and F are of the general type of selector switches shown in United States Letters Patent No. 815,321, granted March 13, 1906, to Keith, Erickson and Erickson, the circuits being modified, however, as shown in said British patent No. 1,419 of 1910, in order to operate in a two-wire system.

The connector H is of the general type of connector switches disclosed in United States Letters Patent No. 815,176, granted March 13, 1906, to Keith, Erickson and Erickson, but, like the selectors, is also modified in order to operate in a two-wire system and being especially adapted to a party-line system.

In order to give a complete understanding of my invention it will be explained in general how a complete connection is established between the calling substation A and the called substation A′, the number of which latter will be assumed to be 2220. Since the apparatus shown herein is in general well known in the art and is fully described in the publications hereinabove referred to, it is not thought necessary to describe its construction and operation in detail herein. When the receiver is removed from the switch hook at the substation A preparatory to making a call, the switch hook 4 rises in the usual manner, and at the instant the spring 18 engages the spring 16 and before the spring 16 disengages the spring 17, the relay 11 is bridged across the line conductors 22 and 22ª, whereby a circuit is closed extending from ground G′ at the central office through the springs 23 and 24, line 22ª, springs 18, 16 and 17, relay 11, line 22, springs 25 and 26 and the line winding 27 of the line switch C to the battery lead 28, thence through battery B to ground G. The relay 11, upon energizing, attracts its armatures 13, 14 and 15, which thereupon become locked in their operated positions, as previously explained. The armature 13, in its operated position, completes a connection from the line conductor 22 through the relay 10 to the hook switch spring 19. The armature 15, in its operated position, bridges the talking circuit across the line conductors 22ª and 22. This bridge extends from the line conductor 22ª through the hook springs 18 and 16, transmitter 3, receiver 2, impulse springs 7 and 8, armature 15 and push button springs 29 to the conductor 22. When the transmitter and receiver are thus bridged across the line, the current through the line winding of the switch C is increased sufficiently to cause said winding to attract its armature 30, if it was not already so energized in series with the relay 11, which has considerable resistance. The armature 30, upon being attracted, closes the circuit of the operating winding 31, which causes the line switch C to operate in the usual manner to extend the line connection through the springs 32 and 33 and 34 and 35 to the first selector E, and the switch C is disconnected from the line by its cut-off armature 36. When connection is extended to the first selector E, the line relay 37 becomes energized by reason of the bridge across the line through the talking circuit of the substation A and, upon energizing, closes the circuit of the relay 38. The relay 38, upon energizing closes a holding circuit for the winding 39 of the line switch C.

It will be seen that when the receiver is removed from the switch hook at the calling station the talking circuit is not bridged across the line by the simple operation of the hook switch springs, as is usually the case, but is dependent upon the energization of the relay 11. The relay 11 is momentarily bridged across the line as the switch hook goes up. This relay 11 has a high resistance compared with that of the talking circuit of the telephone. If no talking circuits are bridged across the line at the time this relay is bridged across it, this relay energizes as described. If, however, the line had been in use by some other substation at the time the receiver was removed from the switch hook at the substation A. the relay 11, when it became bridged across the line, would have been shunted by the talking circuit at the first substation, and this would have shunted sufficient current away from the relay 11 to prevent it from being operatively energized and the talking circuit at the substation A would not have been bridged across the line. It will thus be seen that while the line is in use at one station no subscriber at any of the other stations can get in on the line.

The connection having been extended to the first selector E by the removal of the receiver at the calling substation, the calling subscriber now operates his calling device for the first digit 2 of the called number, whereby the substation impulse springs 7 and 8 are separated twice momentarily. Each time the impulse springs are separated, the line relay 37 of the selector E deënergizes. Each deënergization of the relay 37 transmits an impulse of current through the vertical magnet 40 of the selector. Since the digit called is 2, the vertical magnet operates twice to raise the switch shaft and its wipers two steps, after which the side switch passes to second position and causes the rotary magnet 41 to operate in the usual manner to rotate the wipers on to the contacts of an idle trunk line leading to a second selector F. The side switch thereupon passes to third position and, through the medium of its wipers 43 and 44, disconnects the line relay 37 from the line circuit and extends the line connection through the shaft wipers 45 and 46 and the contacts upon which they have been rotated to the second selector F. The line relay 48 of the second selector thereupon becomes energized in the same manner in which the line relay of the first selector was energized when connection was first extended to it.

When the substation calling device is operated for the second digit 2 of the called number, the selector F operates in the same manner as explained for the selector E in connection with the previous digit to extend the connection over the trunk conductors 49 and 50 to an idle connector H which has access to the group of lines to which that of the substation A′ belongs and which is supplied with ringing current of the proper character to operate the ringer at the substation A′. When the connection is thus extended to the connector H, its line relays 52 and 53 become energized. Each of these relays, upon energizing, closes an energizing circuit for the relay 54.

When the calling subscriber operates his calling device for the third digit 2, the line is again opened twice, each time breaking the circuit of the connector relays 52 and 53. The relay 54, being a slow acting relay, does not have time to deënergize during the momentary interruption of its circuit by the momentary deënergization of the relays 52 and 53. Consequently, each time the relay 52 deënergizes, a circuit is closed from ground G^3 through the spring 55 and its back contact, spring 56 and its front contact, relay 57, vertical magnet 58 and the side switch wiper 59 to the battery lead 28. Since the digit called is 2, the vertical magnet receives two impulses over this circuit and operates to raise the switch shaft and wipers two steps. The relay 57, which is included in circuit in series with the vertical magnet 58, is a slow acting relay and is energized by the first impulse through it and remains energized until after the last impulse for the digit is delivered. By energizing and deënergizing, the relay 57 transmits an impulse of current through the private magnet 60, which in turn, upon energizing and deënergizing, causes the side switch to pass from first to second position. The side switch wiper 59, in passing from first to second position, transfers the battery connection from the vertical magnet 58 to the rotary magnet 61. The calling subscriber now operates his calling device for the last digit 0, whereby the connector line relay 52 is deënergized ten times. Each time the relay 52 deënergizes in this case an impulse of current is transmitted through the relay 57 and the rotary magnet 61, instead of the vertical magnet as before. The rotary magnet operates in response to the ten impulses for this digit to rotate the wipers ten steps onto the contacts of the line 2220. The relay 57 operates in response to the impulses for this digit in the same manner as for the previous digit to cause the private magnet to step the side switch from second to third position after the last impulse for the last digit is delivered to the rotary magnet.

The side switch wipers 62 and 63, upon reaching third position, complete the connection between the calling and the called line, as indicated by the heavy conductors in the drawing. The side switch wiper 64, upon reaching third position, provides a

guarding potential for the connector private bank contacts of the called line and an energizing circuit for the cut-off winding 65 of the line switch C'. This guarding potential and circuit extends from ground G^5 through the side switch wiper 64, shaft wiper 66, thence to all the connector private bank contacts of the called line and also through the winding 65 to the battery lead 28. The winding 65, upon energizing, attracts the armature 67, whereby the line switch C' is disconnected from the line and the contact 68 in the talking circuit is closed. The side switch wiper 59 of the connector, upon reaching third position, completes a circuit for the ringing relay 69, which circuit extends from ground G^9 through the interrupter 70, springs 71, relay 69 and the side switch wiper 59 to the battery lead. The relay 69, upon energizing, disconnects the calling line from the called line and bridges the ringing current generator R across the called line to signal the called subscriber. Since the circuit of the ringing relay 69 includes the interrupter 70, this relay is energized only intermittently, so as not to ring the called subscriber continuously. When the called subscriber removes his receiver from the switch hook, the relay 21 is bridged across the line by the closure of the hook switch springs 72 and 73. It will be seen that normally the transmitter and the receiver at the called station are short-circuited through the armature 74 of the relay 21 and its back contact. As soon as the relay 21 is thus bridged across the line, it is energized. The relay 21, upon energizing, bridges the talking circuit across the line through the armature 74 and its front contact and becomes locked in its operated position, as explained in connection with the relays 10 and 11 at the calling substation A. As soon as the talking circuit at the called substation is bridged across the line, or as soon thereafter as the ringing relay 69 at the connector deënergizes, if it happens to be energized at the time, the called substation is provided with talking current over a circuit extending from ground G^5 through the side switch wiper 64, lower winding of the back-bridge relay 75, thence over the heavy conductors through the springs of the ringing relay, side switch wiper 63, shaft wiper 76, substation hook switch springs 73 and 72, impulse springs 77, receiver 78, transmitter 79, armature 74 and its front contact, push button 80, contact 68, wipers 81 and 62, and the ringing relay springs, and through the upper winding of the back-bridge relay 75 to the battery lead 28. The back-bridge relay 75 is energized by this current, and by separating the springs 71 cuts off the ringing relay 69.

After the conversation is completed the entire connection is automatically 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 release relays 38 and 82 of the selectors E and F, as well as the relay 54 of the connector, are maintained energized through the springs of the connector line relays 52 and 53. When the calling subscriber hangs up his receiver, these relays 52 and 53 deënergize and break the circuits of the relays 54, 82 and 38 of the switches H, F and E, respectively. The relays 54, 82 and 38, upon deënergizing, close the circuits of their respective release magnets 83, 84 and 85, which, upon energizing, release their respective switches. The relay 38 of the selector E, upon deënergizing, also destroys the holding circuit of the winding 39 of the line switch C and allows said switch to be restored to normal position. When the receiver at the calling substation is first hung up and the springs 18 and 19 come into contact, the relay 10 is bridged across the line conductors 21 and 22 through the armature 13 and its front contact. The relay 10 energizes and by lifting the lever 12 unlocks the armature of the relay 11 and allows it to resume its normal position. As soon as the armature 13 disengages its front contact, the bridge across the line through the relay 10 is broken. At the called substation the relay 20 is energized by the hanging up of the receiver and unlocks the relay 21 in the same manner as explained for the relay 10 at the calling substation.

In the foregoing it has been explained how the connector H completed connection with an idle line. In case the called line is busy the connector H will not complete connection therewith, and the calling subscriber will be given a busy signal in the following manner: Whenever a line is in use, either on account of having made a call or on account of having been called, there is a guarding ground potential upon its connector private bank contacts. Therefore, when the private wiper 66 of the connector engages the contact of a busy line, a ground potential is extended from said contact through said wiper, thence through the side switch wiper 64 (which is then in second position) and through the relay springs 86 and 87 and the relay 88 to the spring 89 of the private magnet relay 57. Therefore, when the private magnet relay deënergizes after the last impulse for the last digit is delivered, it does not break the circuit of the private magnet 60, but forms a new holding circuit for said magnet by way of the relay 88 and the private wiper 66. The private magnet, therefore, does not deënergize to permit the side switch to pass to third position and the connection with the called line is maintained open at the side switch wipers 62 and 63. The relay 88, which is included in the lock-

ing circuit of the private magnet 60, upon energizing, shifts the holding ground of itself and the private magnet from the guarded private bank contact to the ground G^6 by way of the springs 87, 90 and 91 and the side switch wiper 92. The private magnet remaining energized and the side switch remaining locked in second position, the busy signaling machine S is connected with the calling line through the springs 93 of the private magnet and through the side switch wiper 63 (in second position), thence through the springs of the ringing relay and through the condenser 95, trunk conductor 50 and thence over the heavy conductors to and through the calling substation.

It having been shown how the connector is prevented from completing connection with a busy line, and since a calling line is provided with a guarding potential upon its connector private bank contacts as soon as the call is initiated, some special means must be provided in order to permit a calling subscriber to call back upon his own line to signal another subscriber thereon. This is accomplished in the following manner: The guarding potential which is placed upon the private bank contacts of the calling line extends from ground G^7 at the selector E (Fig. 1) through the springs 96, thence through the springs 97 of a slow acting relay, line switch bank springs 98 and 99 and the conductor 100 to the connector private bank contacts. The springs 97 are controlled by a slow acting relay 101, which in turn is controlled by a relay 102 which is inserted in one side of the trunk line leading from the line switch to the first selector. It will thus be seen that all the impulses for operating the switches E, F and H must pass through the relay 102. Each time this relay deënergizes in response to these impulses, it closes the circuit of the relay 101, this circuit extending from ground G^7 through the springs 96 and 103 and the relay 101 to the battery lead 28. The relay 101, upon energizing, separates the springs 97, thereby removing the short-circuit around the resistance 105, whereby said resistance is included in the ground connection of the connector private bank contacts of the calling line. The relay 101 is a slow acting relay and therefore remains energized continuously while the impulses are being transmitted through the relay 102 for any digit, and also remains energized for a short time after the last impulse for each digit is completed. Thus it will be seen that when a calling subscriber is calling back on his own line, at the time when the private magnet relay 57 deënergizes after the last digit is called, the resistance 105 will be included in the circuit, which tends to lock the private magnet 60. This resistance is high enough to prevent said magnet from being locked and the side switch passes to third position in the usual manner and connection is therefore completed. A moment later the relay 101 deënergizes and short-circuits the resistance 105, thereby restoring the guarding potential of the line to its normal condition to prevent any other connector from obtaining connection therewith.

When a calling subscriber calls back on his own line, a circuit will be closed through the back-bridge relay of the connector through the talking circuit of the calling substation. This will energize the back-bridge relay and prevent the ringing relay 69 from operating to signal the called subscriber. In order to signal the called subscriber in this case, the subscriber at the calling substation depresses the push button 29. This depressing of the push button opens a short-circuit around the relay 11 and includes said relay in the bridge across the calling line. This increases the resistance of the bridge sufficiently to cause the connector back-bridge relay 75 to allow its armature to drop back and close the circuit of the ringing relay. The insertion of the resistance of the relay 11 in the bridge across the line at the calling substation also increases its resistance sufficiently, so that when the called subscriber removes his receiver there will not be enough current shunted away from his relay 11 to prevent it from operating to complete his talking circuit, and, therefore, two subscribers are enabled in this manner to come in on the line at the same time. Of course, when the talking circuit at the called substation becomes bridged across the line, the connector back-bridge relay 75 energizes again and cuts off the ringing current. The calling subscriber then releases his push button and the two subscribers carry on their conversation in the usual manner.

It will be seen that the connector H has two line relays 52 and 53, and that after the connection is completed either one or both of these relays must be maintained energized in order to prevent the connection from being released. The object in providing two relays is that the relay 52 must be adjusted so as to respond to the impulses for operating the switch. When it is thus adjusted it may possibly deënergize when the push button at a calling station is depressed to signal a called subscriber on the same line. The relay 53, however, not having to respond to any impulses, may be adjusted so that it will not be thus deënergized when the button at the calling substation is depressed, and will therefore prevent the connection from being released.

While I have illustrated my invention in connection with an automatic system of one particular type, it is to be understood

that I do not wish to limit my invention to such system, as it is equally as well adapted for use with any automatic or semi-automatic system, or could even be employed advantageously in a system which is entirely manual.

What I claim as my invention is:—

1. In a telephone system, a party-line, a plurality of telephone stations thereon, a relay at each of said stations, means for energizing said relay when said line is taken for use at any station, means controlled by said relay for preventing any other subscriber from coming in on said line when said line is busy, an electromagnet, and means controlled by said electromagnet for returning said relay to normal position.

2. In a telephone system, a party-line, a plurality of substations thereon, a relay at each of said substations, means for energizing the corresponding relay when a receiver is removed from the hook at a substation, means for locking said relay in an energized position, means controlled by the energization of said relay for preventing any other subscriber from coming in on said line while the same is in use, an electromagnet, and means controlled thereby for unlocking said relay.

3. In a telephone system, a party-line, a plurality of substations thereon, a relay at each of said substations, means for energizing the corresponding relay when a receiver is removed from the hook at a substation, means for locking said relay in an energized position, means controlled by the energization of said relay for preventing any other subscriber from coming in on said line while the same is in use, an electromagnet, means controlled thereby for unlocking said relay, and means for energizing said electromagnet when the receiver is replaced upon the hook.

4. In a telephone system, a party-line having a plurality of substations thereon, a relay bridged across the line at each of said stations, means for energizing one of said relays upon the removal of the corresponding receiver from its hook, means controlled by said relay for closing the talking circuit, means for preventing said relay from energizing when a receiver is removed from the hook and said line is busy, means for locking said relay in an energized position, and an electromagnet for unlocking said relay.

5. In a telephone system, a party-line having a plurality of substations thereon, a relay bridged across the line at each of said stations, means for energizing one of said relays upon the removal of the corresponding receiver from its hook, means controlled by said relay for closing the talking circuit, means for preventing said relay from energizing when a receiver is removed from the hook and said line is busy, means for locking said relay in an energized position, an electromagnet for unlocking said relay, and means for energizing said electromagnet when the receiver is replaced upon the hook.

6. In a telephone system, a party-line having a plurality of substations thereon, a relay at each substation bridged across said line, means for energizing one of said relays upon removing a receiver from its hook, means for locking said relay in an energized position, means operated by said relay for closing a low resistance talking bridge across said line in shunt of said relay, said shunt preventing any other relay being energized upon the removal of any other subscriber's receiver from the hook, an electromagnet, means controlled thereby for unlocking said relay, and means for energizing said electromagnet upon replacing said receiver upon its hook.

7. In a telephone system, a party-line having a plurality of substations thereon, electrically-operated means at each of said substations for bridging the talking circuit at its substation across the line provided the talking circuit is not bridged across the line at any other substation, and electrically-operated means for returning said relay to normal position.

8. In a telephone system, a party-line, a plurality of telephone stations thereon, a relay at each of said stations, means for energizing said relay when said line is taken for use at any station, means controlled by said relay for preventing any other subscriber from coming in on said line when said line is busy, an electromagnet, means controlled by said electromagnet for returning said relay to normal position, automatic impulse-transmitting means on said line, and automatic switches controlled thereby.

9. In a telephone system, a party-line, a plurality of substations thereon, a relay at each of said substations, means for energizing the corresponding relay when a receiver is removed from the hook at a substation, means for locking said relay in an energized position, means controlled by the energization of said relay for preventing any other subscriber from coming in on said line while the same is in use, an electromagnet, means controlled thereby for unlocking said relay, automatic impulse-transmitting means on said line, and automatic switches controlled thereby.

10. In a telephone system, a party-line, a plurality of substations thereon, a relay at each of said substations, means for energizing the corresponding relay when a receiver is removed from the hook at a substation, means for locking said relay in an energized position, means controlled by the energization of said relay for preventing any other subscriber from coming in on said line while the same is in use, an electromagnet, means controlled thereby for unlocking

said relay, means for energizing said electromagnet when the receiver is replaced upon the hook, automatic impulse-transmitting means on said line, and automatic means controlled thereby.

11. In a telephone system, a party-line having a plurality of substations thereon, a relay bridged across the line at each of said stations, means for energizing one of said relays upon the removal of the corresponding receiver from its hook, means controlled by said relay for closing the talking circuit, means for preventing said relay from energizing when a receiver is removed from the hook and said line is busy, means for locking said relay in an energized position, an electromagnet for unlocking said relay, automatic impulse-transmitting means on said line, and automatic switches controlled thereby.

12. In a telephone system, a party-line having a plurality of substations thereon, a relay bridged across the line at each of said stations, means for energizing one of said relays upon the removal of the corresponding receiver from its hook, means controlled by said relay for closing the talking circuit, means for preventing said relay from energizing when a receiver is removed from the hook and said line is busy, means for locking said relay in an energized position, an electromagnet for unlocking said relay, means for energizing said electromagnet when the receiver is replaced upon the hook, automatic impulse-transmitting means on said line, and automatic switches controlled thereby.

13. In a telephone system, a party-line having a plurality of substations thereon, a relay at each substation bridged across said line, means for energizing one of said relays upon removing a receiver from its hook, means for locking said relay in an energized position, means operated by said relay for closing a low resistance talking bridge across said line in shunt of said relay, said shunt preventing any other relay being energized upon the removal of any other subscriber's receiver from the hook, an electromagnet, means controlled thereby for unlocking said relay, means for energizing said electromagnet upon replacing said receiver upon its hook, automatic impulse-transmitting means on said line, and automatic switches controlled thereby.

14. In a telephone system, a party-line having a plurality of substations thereon, electrically-operated means at each of said substations for bridging the talking circuit at its substation across the line provided the talking circuit is not bridged across the line at any other substation, electrically-operated means for returning said relay to normal position, automatic impulse-transmitting means on said line, and automatic switches controlled thereby.

15. In a telephone system, a party-line having a plurality of substations thereon, electrically-operative means individual to each substation for preventing interference between two subscribers, and electrically-operative means at the calling substation for restoring said first-mentioned means to normal position.

Signed by me at Chicago, Cook county, Illinois, this 24th day of February, 1912.

BERNARD D. WILLIS.

Witnesses:

ARTHUR J. RAY,

ALBERT ANDERSEN.