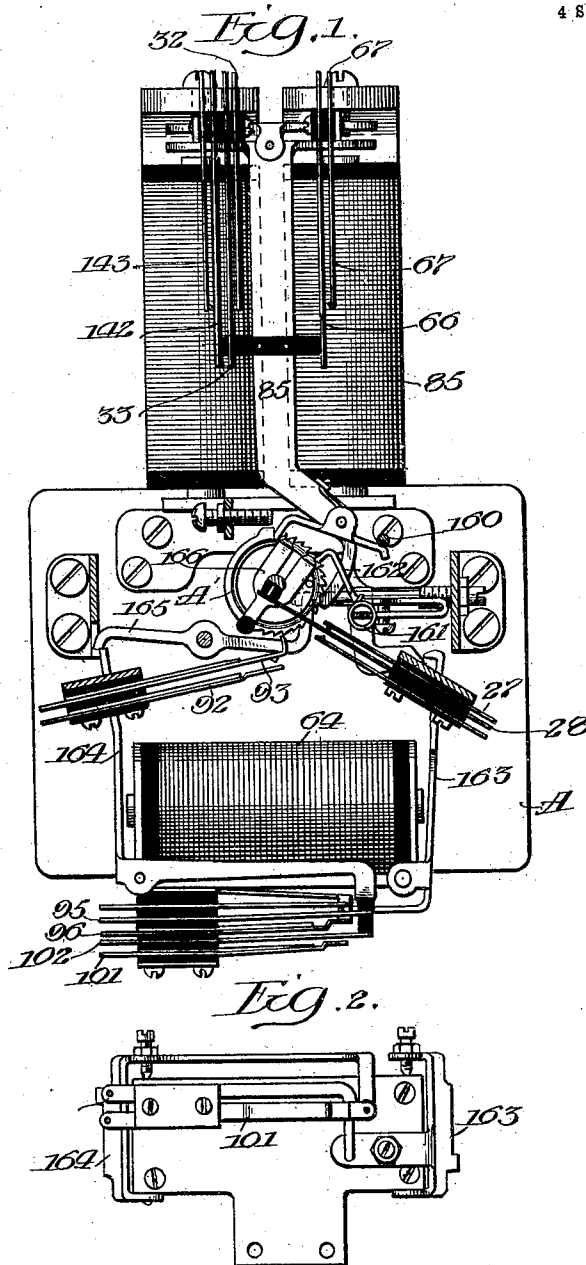


C. A. ANDERSON.
PARTY LINE TELEPHONE EXCHANGE.
APPLICATION FILED FEB. 28, 1910.

980,857.

Patented Jan. 3, 1911.

4 SHEETS—SHEET 1.



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4 SHEETS—SHEET 2.

Fig. 3.

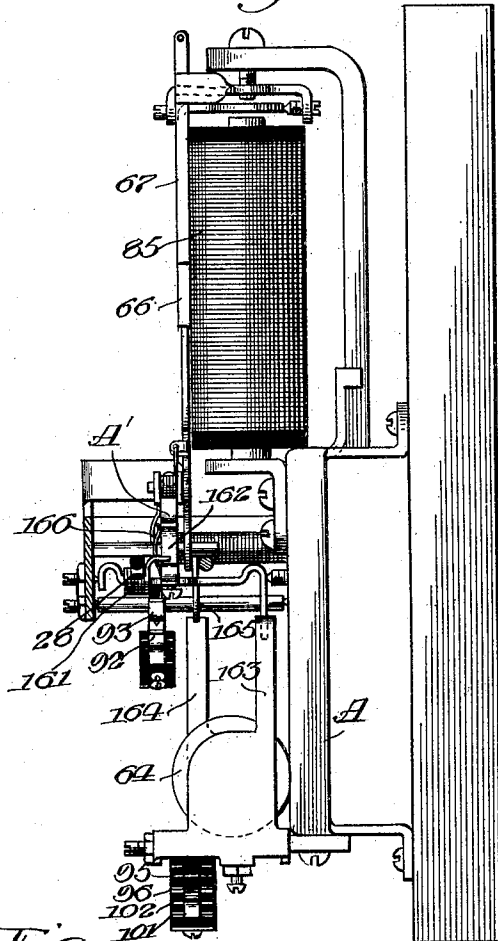
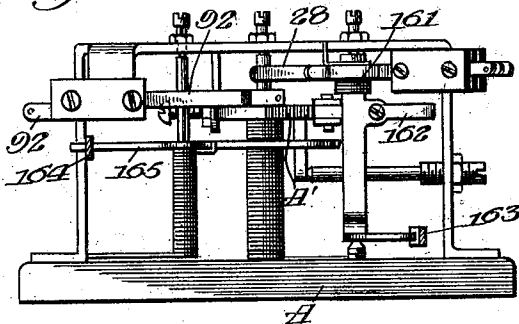


Fig. 4.



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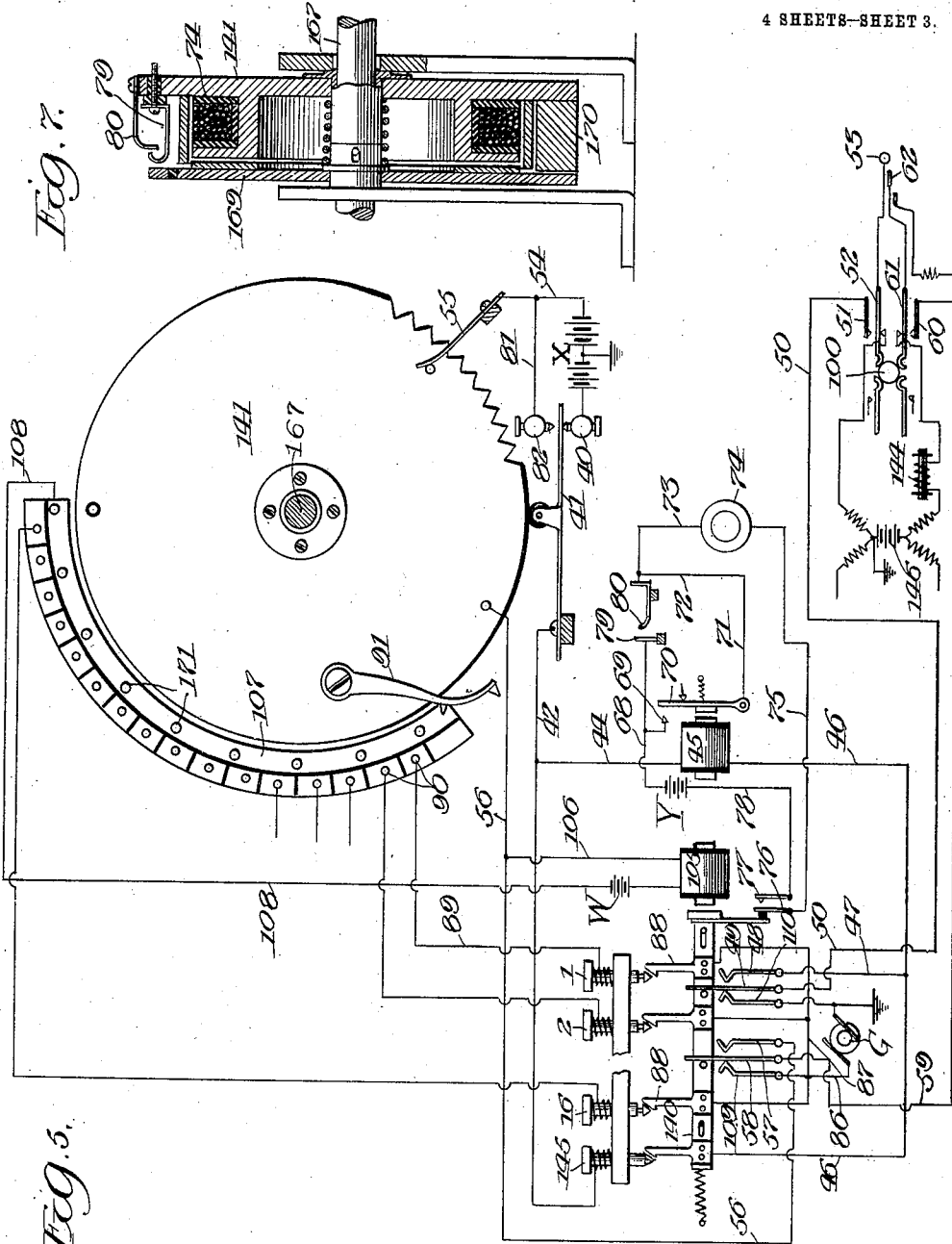


Fig. 5.

Fig. 7.

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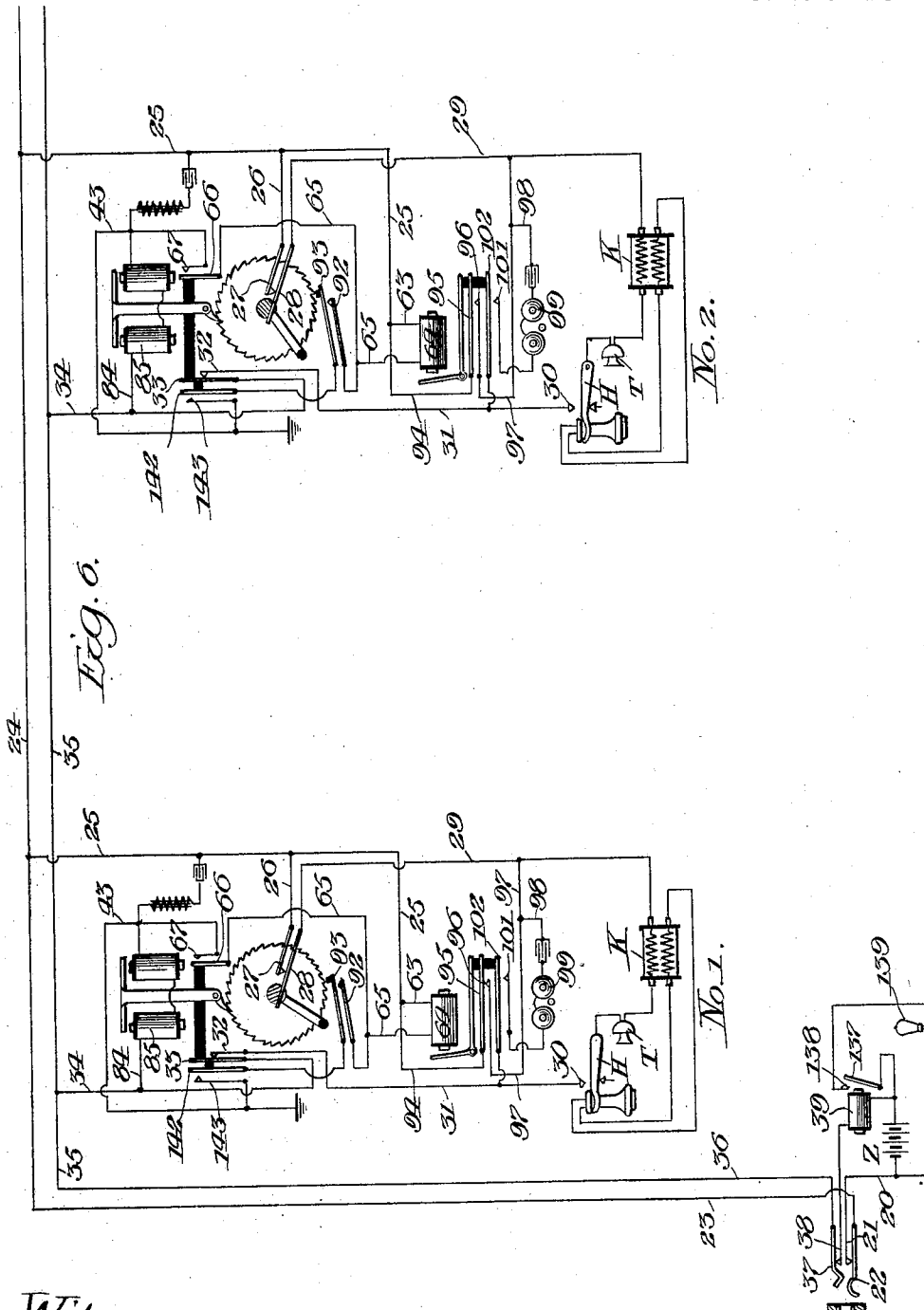
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4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

CLARENCE A. ANDERSON, OF SALINA, KANSAS, ASSIGNOR TO THE ANDERSON ELECTRIC & MANUFACTURING CO., OF WICHITA, KANSAS.

PARTY-LINE TELEPHONE-EXCHANGE.

980,857.

Specification of Letters Patent.

Patented Jan. 3, 1911.

Application filed February 28, 1910. Serial No. 546,405.

To all whom it may concern:

Be it known that I, CLARENCE A. ANDERSON, a citizen of the United States of America, and a resident of Salina, Kansas, have
5 invented certain new and useful Improvements in Party-Line Telephone-Exchanges, of which the following is a specification.

My invention relates to party line telephone exchanges and has for its object improvements in such devices.

For the purpose of giving some preliminary information as to the general character of the invention herein involved, I will state some of the principal characteristics
15 set forth in the drawings, and as will be further explained hereinafter.

Briefly, the principal characteristics may be stated as follows: The system is a party line exchange of the lock-out type adapted
20 to use central energy for both operating and talking. Lock-out systems are of various constructions, but they all involve one characteristic, namely, the use of some apparatus by which an unusual or special movement
25 is made at the desired local stations on the line, by which special movement that particular station is connected telephonically to the party line, whereas other stations in which such movement does not occur are left
30 disengaged or locked out, as the ordinary term is used.

The system uses a calling device at the central office, from which device impulses are sent over the party line to operate the
35 devices at the local stations. In the present case these impulses are alternately in opposite directions; the switching devices at the local stations being made so that they will be operated by such impulses. When operated in this way, the armatures of the electro-magnets used for propelling the switching
40 devices are not returned to their normal positions by springs, but by reverse current. The impulses flowing in one direction are called operating impulses, whereas the impulses flowing in the opposite direction are
45 release impulses. In the present case, however, the release impulse does not of itself cause a release in the switching mechanism, which is effected only when there is associated with it a secondary impulse, the two
50 together effecting the complete release.

For convenience I shall hereinafter designate the alternating impulses from the central office calling device as primary impulses,

while certain other impulses which are associated with them for causing the special movement and also for causing the release I shall term secondary impulses. In the present case I use a power drive for the calling
30 device and arrange a magnetic clutch for connecting the calling device to the power drive when the station is selected. The process of selecting the station is accomplished by placing upon the calling device,
35 or adjacent thereto, a series of numbered keys, each key representing a different local station on the party line. The depression or manipulation of a key to select a desired station automatically connects the calling
70 device to the power drive. I also provide in the same apparatus automatic arrangements or connections for stopping the calling device and permitting it to return to normal position as soon as it has completed
75 the cycle of impulses for which it is set. In this connection I will say that the calling device is made so as to be applicable to the large number of stations on a party line, but it is set so that it will operate beyond the
80 greatest number of stations that exist upon any of the party lines which it serves. Thus, if the calling device should be made for twenty stations and should be used in a place in which ten or twelve stations would
85 be the greatest number on any one party line, then the device would be set so that it would operate for that number of stations and would return to normal position as soon as it had completed sending a sufficient
90 number of impulses to accommodate that number of stations. I also provide an automatic arrangement for ringing or signaling the selected stations; this automatic arrangement being so made that the calling
95 device will cause the ringing circuit to pass over the party line without any special manipulation by the subscriber. I also provide the calling device with connections so arranged that when it begins its operation,
100 the first thing it does is to send a series of impulses over the line so as to permit all the switching devices at the local stations to return to their normal positions in case they had not been returned previously.
105

In the drawings, Figure 1 is a front elevation, partly in section, of the switching device used at the local stations; Fig. 2 is a partial bottom view of Fig. 1; Fig. 3 is a side elevation, partly in section, of Fig. 1; Fig. 4
110

is a bottom view, partly in section, with the parts removed which are shown in Fig. 2; Fig. 5 is a diagram of the central office apparatus; Fig. 6 is a diagram showing two local stations on the party line, and a jack and associated parts that belong to the central office, and Fig. 7 is a section showing a suitable construction for the magnetic clutch, by which the calling device is started into operation.

The switching devices of the local stations are in their main mechanical constructions very similar to other devices which have been in general use and, therefore, I need only describe so much as will be necessary to illustrate the changes which I have introduced to meet the requirements of the general mode of operation hereinafter to be described.

The switch is mounted upon a base A and consists of a ratchet wheel A^1 which is provided with a pawl mounted upon the armature lever of a magnet 85. The magnet 85 is polarized so that impulses in opposite directions move the armature lever back and forth. When the armature lever is moved in one direction, the pawl drives the ratchet wheel A^1 forward, whereas when the armature lever is moved in the opposite direction the tail end of the pawl engages a pin 160 and is raised from engagement with the wheel. Pivoted at 161 is a holding pawl 162 which is released by the armature lever 163, operated by a cut-in magnet 64 on the lower part of the base A. It will be evident from what has just been stated that after the ratchet wheel A^1 has been advanced, an operation of the armature 163 to release the holding pawl 162 will not release the ratchet wheel unless the driving pawl is simultaneously released by the release movement of the armature lever belonging to magnet 85. Also that a release movement of this armature lever will not of itself release the ratchet wheel unless the armature 163 moves simultaneously therewith. At the other end of the magnet 64 is an armature lever 164, and adjacent thereto is a catch 165 adapted to hold the armature 164 in a retracted position when the magnet 64 is energized. A pin on the ratchet wheel A^1 releases the catch 165 when the ratchet wheel returns to normal position. This particular construction is previously known. The other end of the armature lies parallel with the magnet 64 and is adapted to engage a series of contact springs located just beneath said magnet. The particular way in which these are closed will be best seen by the diagram of Fig. 6, and will be described in the description of the operation.

On the ratchet wheel A^1 is an arm 166, which is adapted to engage a spring 93 and push it into engagement with the spring 92. The arm 166 is adjustable on the ratchet

wheel A^1 and the number of steps required before the next closure takes place will depend upon that adjustment. At station No. 1 this adjustment is such that the contact is closed when the ratchet wheel has made one step. At station No. 2 the closure will occur when the ratchet wheel has made two steps, and so on. Adjacent to the ratchet wheel are two springs 27 and 28, one of which rests against the actuated part of the shaft for the ratchet wheel A^1 . The adjacent unnumbered spring is used in some forms of exchange employing the same style of switch but is functionless in this. When the ratchet wheel is in its normal position the springs 27 and 28 are in electrical connection with each other, but as soon as the ratchet wheel is moved from normal position this electrical connection is opened. Adjacent to the armature lever, operated by the magnet 85, are some contact springs which are actuated by the movement of said lever. The circumstances under which connections are made and broken by these contacts will be best understood by the diagram and will be described hereinafter.

Referring to Fig. 7, 167 is a continuously driven power shaft, on which is loosely mounted a disk 141, upon which disk is wound the coils 74 of the clutch mechanism. Secured by a feather or pin and slot to the shaft 167 is a disk 169 which turns continuously with the shaft 167, but is axially movable thereon. If a current is sent through the coils 74 the disk 169 is attracted to the disk 141 and the two move together as long as the current flows through the coils 74. Upon breaking the circuit through these coils the disk 141 returns to its normal position in any convenient manner. I have shown a weight 170 as secured to one part of the disk 141; said weight by its gravity falling to the lowest position, which lowest position corresponds to the normal position of the disk 141.

Adjacent to the disk 141 is a plate 107, in which are a series of holes 171, and in any one of these holes a special pin may be placed, which special pin is engaged by the inner one of two projections on arm 91 secured to the disk 141. Also in the plate 107 are holes, in which are placed insulated pins 90. For convenience of illustration I have shown the pins 90 as set in insulated segments of the plate 107. Connecting wires run from the pins 90 to a series of keys marked "1," "2," etc. These keys are selecting keys for selecting the stations; thus, key No. "1" represents station No. 1, and key No. "2" represents station No. 2, and so on. The pins 90 lie in the path and are contacted by the outer projection on the arm 91, when said arm is moved by rotation of the disk 141 to which it is secured. In one portion of the disk 141 are a series of serrations

which are adapted to engage an insulated roller and its spring 41. Such engagement with the serrations causes the spring 41 to vibrate to and fro between contact points 40 and 82, as will be hereinafter described. On a portion of the disk 141 are insulated contact springs 79 and 80. These contact springs are normally out of connection with each other and are pressed into contact with each other when the disk 169 is attracted by current flowing through the coils 74.

Forming part of the calling device is a bar 140 mounted to slide longitudinally on guide pins, or in suitable guides and is moved either by the attraction of a magnet 105, or by the depression of one of the keys, Nos. "1," "2," etc. These keys are so arranged that when one of them is pushed downward it strikes the upper part of the adjacent hook 88, which hook is secured to but insulated from the bar 140. The hook 88, when it engages a depressed key holds that key in a depressed condition until the bar is moved still farther to the right, which is accomplished by the current flowing through the magnet 105. The effect of this is that a current through the magnet 105 releases any depressed key and permits it to return to normal position. The movement of the bar 140 to the right shifts certain electrical connections, as will be readily seen by examining the diagram in Fig. 5. This shift cuts out the connections to the generator G.

In addition to the particulars so far described there are a number of electrical contacts, a plug with its connections, a signal lamp, contact and other parts, which will be readily understood from the description of the operation, which operation may be set forth as follows: The subscriber removes his receiver and his hook rises to close contact at 30. A current flows:—battery Z—20—21—22—23—24—25—26—27—28 (closed in normal position)—29—K—T—H—30—31—32—33—34—35—36—37—38—39—Z. This energizes magnet 39 to close 137 to 138, whereupon current flows from the battery Z through the local circuit to light the lamp 139. This in turn informs the operator that a subscriber on this particular party line has called. The operator then inserts a plug (lower right hand corner of Fig. 5) in the jack of the line from which the call comes. This breaks the circuit for magnet 39 at 21—22 and 37—38, and the consequent deenergization of the magnet 39 breaks the circuit for the lamp 139. The operator then presses key 100 to the left for the purpose of connecting her telephone set to the calling line. As such connections are well known to the operator's telephone set and connections therefor are not shown in the drawings. Upon learning who called and who is wanted she depresses the corresponding keys on the calling device. For convenience it will be as-

sumed that subscriber at station No. 1 called and wants the subscriber at station No. 2, and that both are on the same party line. She therefore depresses key "1" and "2", shown at the lower left hand part of Fig. 5, which keys represent stations 1 and 2. Depressing a station indicating key until it is caught and held by its corresponding hook 88 moves the bar 140 to the right to close contacts 76 and 77, and also shifts the contact springs 49 and 58 from the contacts at their left to those at their right. This last cuts the generator G from connection to the plug used. She also presses key 100 to the right to close connections to 51 and 60, whereupon a current flows:—X—40—41—42—44—45—46—47—48—49—50—51—52—53—37—36—35—34 of each station on the line—84—85—43—ground—X. Also, X—54—55—base—56—57—58—59—60—61—62—22—23—24—25 of each station on the line—63—64—65—66—67 (closed by impulse through 85)—43—ground—X. The impulse first described is in that direction through the magnet 85 which causes its armature to move in the release direction, and the other impulse through the magnet 64 releases the holding pawl 162. The two of them coming together releases the switching mechanism to permit it to return to normal position if it is not there previously.

The impulse previously described through magnet 45 causes its armature 70 to engage 69; when a current flows: Y—68—69—70—71—72—73—coil 74 of the magnetic clutch—75—76—77—78—Y. This operates the magnetic clutch to drive the serrated disk 141, and in its operation it closes 79—80 to produce a shunt circuit for the magnetic coil 74 around the contacts 69—70.

The release impulses through 85 and 64, previously described, continue until the disk has moved far enough to break connections with 55 and to bring the serrations into engagement with the insulated roller on the spring 41. When this occurs the spring 41 by its own tension moves from contact 10 to contact 82, when a current flows: X—54—81—82—41; and over the previous circuit through magnets 85 to ground at each local station. This is an impulse from the opposite pole of the battery to that previously described and operates to advance the switches of all stations one step. As the disk 141 advances the serrations cause the spring 41 to vibrate between contacts 40 and 82, sending alternate operating and releasing impulses through the magnets 85. These release impulses do not, however, release the switches because complete release depends upon the simultaneous operation of magnets 64 to release the holding pawls, and no impulse flows through those magnets by the operation of the serrations alone. The impulses, therefore, simply move the driving

pawls back and forth to operate (advance) the switches.

As the disk 141 advances, the outer contact on the end of the arm 91 engages the insulated pins in the plate 107. At the time it has advanced far enough to strike the first pin 90 the ratchet wheel at station No. 1 has advanced enough to have arm 166 close contacts 92—93. When the arm 91 has advanced far enough to engage the second pin 90, the ratchet wheel at station No. 1 has moved far enough to have its arm past contacts 92—93, while the ratchet wheel at station No. 2 has reached the position at which its arm 166 will close the adjacent contacts 92—93. The same is true with respect to the succeeding pins 90 and the contacts 92—93 at the other local stations.

As it has been previously assumed that key "1," which corresponds to station No. 1 and the first pin 90 has been pressed, it consequently follows that when arm 91 strikes this pin a current will flow from generator G—86—87—88—key "1"—89—first pin 90—91—base 141—56—57—58—59—60—61—62—22—23—24—25 of station No. 1—63—64—65—92—93—142—143—ground—G. This operates the magnet 64 to attract its armature, and, as the ratchet wheel at this station has moved from its normal position the armature is held in its attracted position so as to maintain the electrical connections of the contact springs just below the said magnet 64. This holding of the armature 164 is due to its being caught and held by the hook on the lever 165, the said hook being enabled to accomplish this result by reason of the advance of the ratchet wheel so that the pin thereon is removed from contact with the other end of the lever 165. This construction is shown in Fig. 1. The releasing armature of the magnet 64 is also attracted at the same time, but as the contacts with the pins 90 are arranged to occur only when the spring 41 engages contacts 82, and consequently when the magnets 85 are driving their respective ratchet wheels, this action does not release the switch. When the arm 91 connects with the pin 90 connected by the second key which was depressed by the operator, a like result occurs at the corresponding local station.

In a portion of the plate 107 is a series of holes in any one of which a special pin may be placed. This portion is connected through battery W to magnet 105, the connection being shown to the plate adjacent to the last hole. This pin is in the path of the inner projection on the arm 91, and when the arm comes into contact with this pin a current flows: W—105—106—56—base—91—107—108—W. Energizing magnet 105 draws its armature and the bar 140

to the right so as to release the depressed station selecting pins from the hooks 88, by which they were held in a depressed condition. The deenergization of the magnet 105 by the arm 91 passing the special pin in the plate 107, permits the bar 140 to return to its normal position as shown in Fig. 5. When this occurs the generator G is connected to the line and a ringing circuit is completed: G—86—109—58—59—60—61—62—22—23—24—25—94—95—96—97—98—99—101—102—31—32—33—34—35—36—37—53—52—51—50—49—110—G. This signals the selected subscribers, and this ringing is maintained as long as the operator holds the key 100 pressed to the right. Normally this will be until the calling device has reached its normal position after being released by the impulse through the magnet 105. The subscribers having been signaled, will remove their receivers when the talking circuit will be:—K at station No. 1—T—H—30—31—32—33—34—35 to 34 of station No. 2—33—32—31—30—H—T—K—29—97—96—95—94—25—24 back to station No. 1—25—94—95—96—97—29—K. The battery 146 at central furnishes the energy for this talking. When through talking the subscribers hang up their receivers which operates the clearing-out drop 144 by breaking its circuit at the receiver hook. The operator then presses key 145 and simultaneously presses key 100 to the right as before. A release impulse then flows from battery X through key 145 and thence over the originally described release circuit. As the key 145 has no notch by which it is caught and held in the depressed position, it returns to normal position as soon as the operator lets go of it.

What I claim is:—

1. The combination with a series of local stations, a central office, and a party line connecting the stations to the office, of devices for sending operating impulses from the office to the stations, a generator for similarly sending signaling impulses, a series of station selecting keys, one for each station, and connections coöperating into said keys whereby a depression of any one of them will connect said devices to the line while the release of a depressed key disconnects the devices and connects the generator.

2. The combination with a series of local stations, a central office, and a party line connecting the stations to the office, of devices at the office for sending operating and signaling impulses to and through the stations, a plug and cord for connecting said devices to any party line terminating in the office, a series of station selecting keys and connections coöperating into said keys whereby upon the manipulation of one of them to select a station, connections will be made to cause the sending of operating impulses while

the release of a manipulated key will make connections to cause the sending of signaling impulses.

3. In a lock-out party line system, switching devices at the local stations, a selecting device at the central office provided with means for connecting it to any party line, a series of keys on the selecting device, by the manipulation of one of which a corresponding station on the connected party line is selected, and automatically operating means for setting the selecting device into operation by manipulating one of said keys.

4. In a party line system, the combination with switching devices at the local stations, by the operation of which selected stations are telephonically connected to the line, of a power shaft located at the central office, a normally idle impulse sending device adapted to be connected to and be driven by the shaft, a plug and cord by which a party line may be connected to the impulse sending device, a series of keys, by the manipulation of one of which a corresponding station on the line is selected for telephonic connection, and means by which the manipulation of any key for the purpose of selecting a particular station causes the automatic connection of the impulse sending device to the power shaft.

5. In a party line system, the combination with the switching devices of the local stations, and the selecting device at the central office provided with station indicating keys, of a power drive for the selecting device, and automatically operating means for connecting the power drive to the selecting device upon the manipulation of one of its station selecting keys.

6. In a party line system, the combination with the switching devices of the local stations, and the selecting device at the central office provided with station indicating keys, of a power drive for the selecting device, automatically operating means for connecting the power to the selecting device upon the manipulation of one of its keys, and automatic means for releasing the selecting device from the power when it has completed its cycle of operations.

7. In a party line system, the combination with the switching devices of the local stations, and a source of electricity for operating them, of a selecting device arranged to send impulses alternately in opposite directions to operate the switching devices, means by which a secondary impulse associated with one of the impulses sent in one direction will connect a selected station to the line, and means by which a similar secondary impulse is associated with an impulse in the opposite direction the switching devices will automatically be returned to their normal positions.

8. In a party line system, the combination with the switching devices of the local sta-

tions, of means for sending impulses alternately in opposite directions through said switching devices, and additional means for associating a secondary impulse with a primary impulse in either direction so that such secondary impulse is also sent through said switching devices.

9. In a party line system, the combination with devices at the central office for sending impulses alternately in opposite directions, and means for associating a secondary impulse with an impulse in either direction, of switching devices at the local stations arranged to be advanced step by step by the alternating impulses, means by which a secondary impulse associated with a primary impulse in one direction will operate a selected switching device to connect its station telephonically to the line, and means by which a secondary impulse associated with a primary impulse in the opposite direction will release all of the switching devices.

10. In a party line system, the combination with devices at the central office for sending impulses alternately in opposite directions, means for associating a secondary impulse with an impulse in either direction, and a series of keys one of which controls the association of the secondary impulse with a different one of the primary impulses in one of said directions, of switching mechanisms at the local stations adapted to be advanced from normal position by the alternating impulses, means by which a secondary impulse controlled by the manipulation of a particular key will operate a selected switching mechanism to connect its station telephonically to the line, and means by which a secondary impulse associated with a primary impulse operates to release the switching mechanisms.

11. In a party line system, the combination with the switching mechanisms of the local stations arranged to have their operations controlled by combinations of impulses sent from the central office, of an impulse sending device arranged to send primary impulses alternately in opposite directions to advance the switching mechanisms and to associate secondary impulses with different ones of the primary impulses to further control and to release the switching mechanisms, a series of station indicating keys each one of which controls the association of a secondary impulse with a particular one of the primary impulses, and means by which the manipulation of any one of said keys starts the impulse sending device into automatic operation.

12. In a party line system, the combination with an impulse sending device at the central office, means for causing it to send impulses alternately in opposite directions over the line, and means for associating sec-

ondary impulses with different ones of the impulses previously mentioned, of switch operating magnets at the local stations arranged to have their armatures vibrated to and fro by the alternating impulses, and other devices at the local stations arranged to be operated by the secondary impulses.

13. In a party line system, the combination with a calling device arranged to send impulses alternately in opposite directions from the central office and over the line, and means for associating secondary impulses with particular ones of the previously mentioned impulses, of switch operating magnets at the local stations arranged to have their armatures vibrated by the alternating impulses, means by which a secondary impulse associated with a primary impulse of one direction serves to connect a selected station telephonically at the line, and means by which a secondary impulse associated with a primary impulse of the opposite direction serves to release the devices controlled by the switch operating magnets.

14. In a party line system, the combination with switching mechanisms at the local

stations adapted to have their operations controlled by impulses sent from a central office, and a calling device for sending such impulses, of devices for controlling the impulses sent so that a particular station will be selected, and electrically operated means also controlled by said devices for starting and stopping the calling device.

15. In a party line system, the combination with switching mechanisms at the local stations, and a device at the central office for sending impulses to control the switching mechanisms, of selecting devices for controlling the impulses so as to cause the switching mechanism of a selected station to operate differently from the switching mechanisms of stations not selected, and electrically operated means controlled by the selecting devices for starting and stopping the impulse sending device.

Signed at Wichita Ks. this 19 day of Feb. 1910.

CLARENCE A. ANDERSON.

Witnesses:

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H. C. ALSPAUGH.