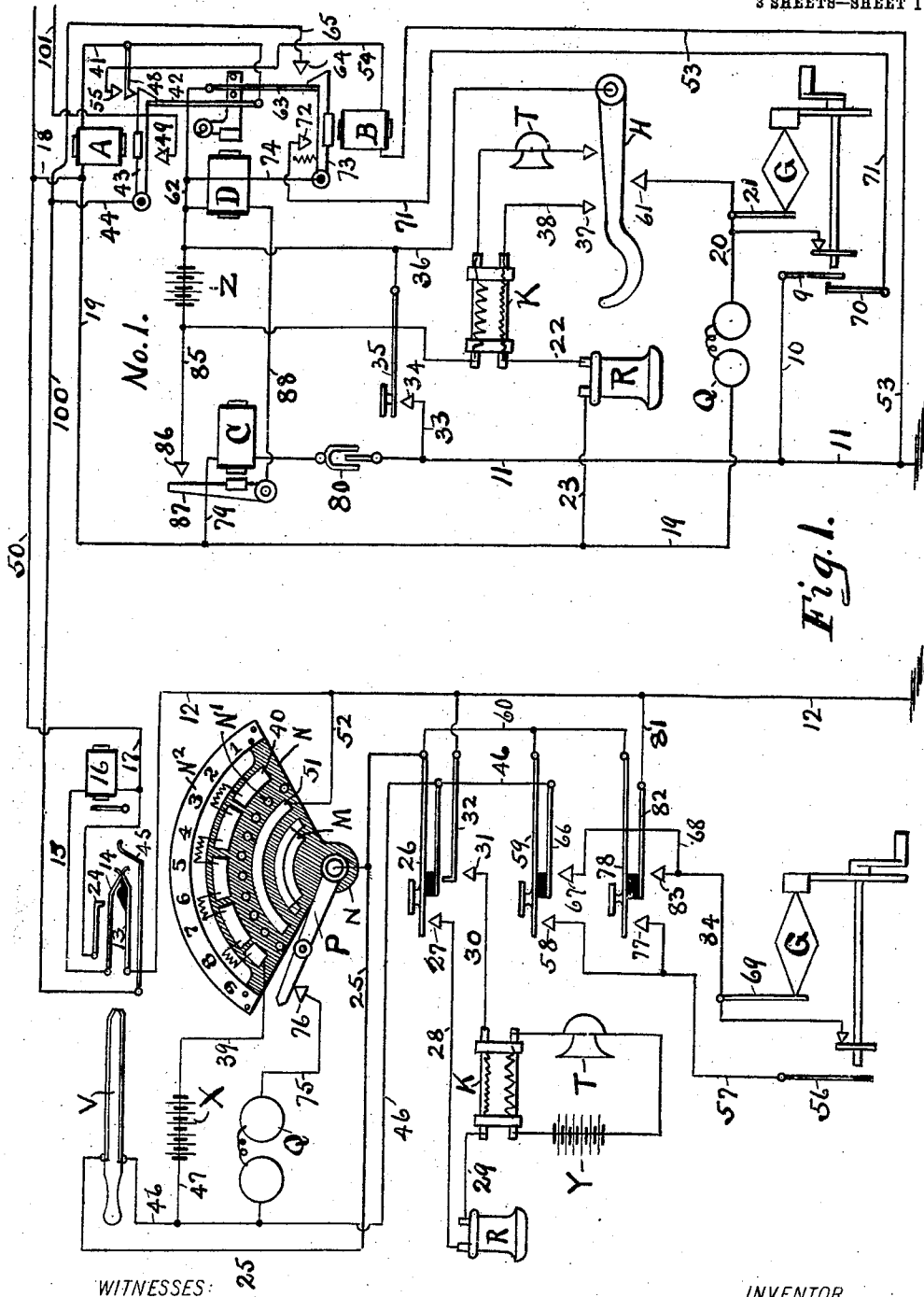


No. 852,675.

PATENTED MAY 7, 1907.

N. E. NORSTROM.
TELEPHONE EXCHANGE.
APPLICATION FILED APR. 6, 1901.

3 SHEETS—SHEET 1.



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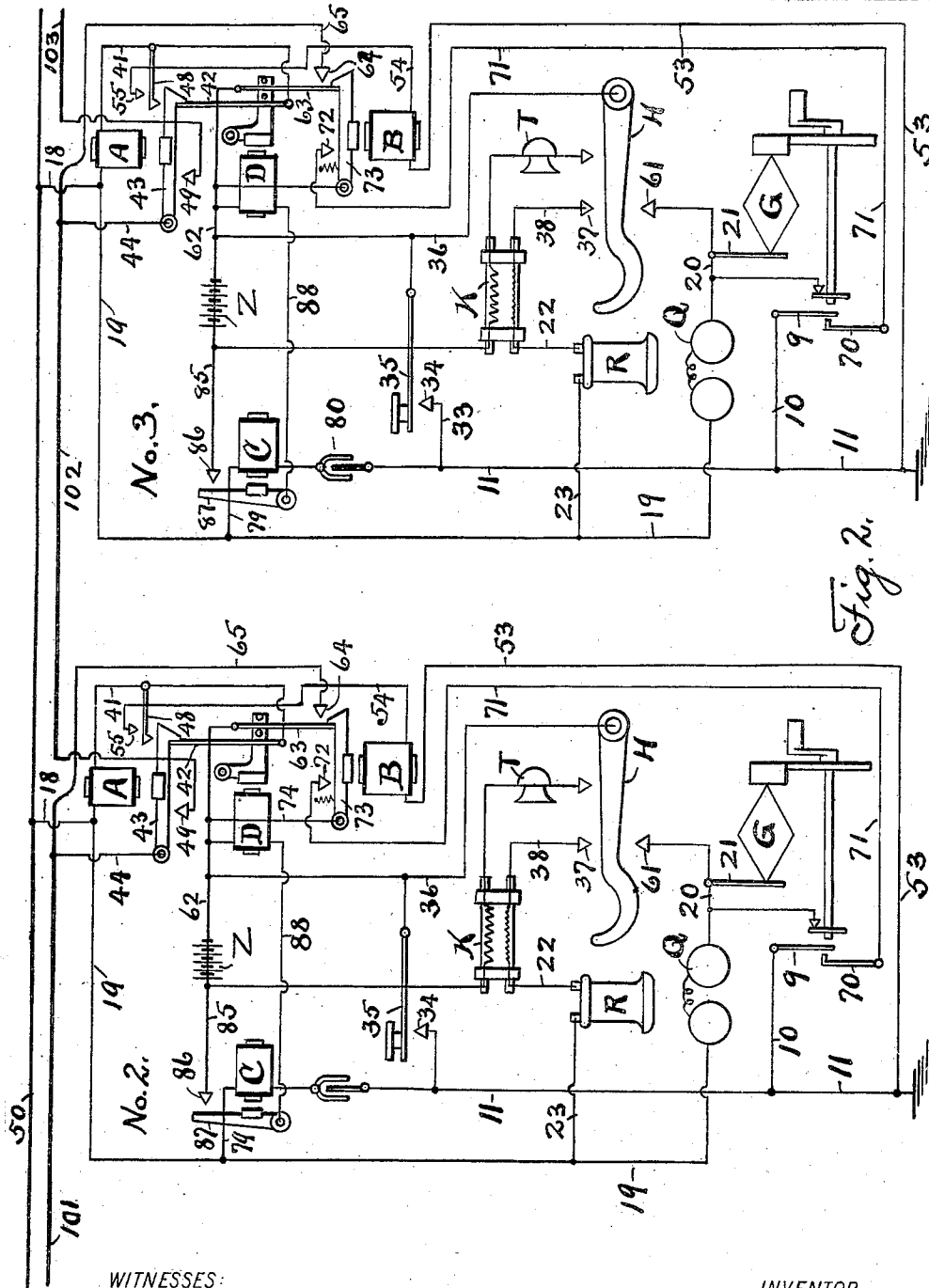


Fig. 2.

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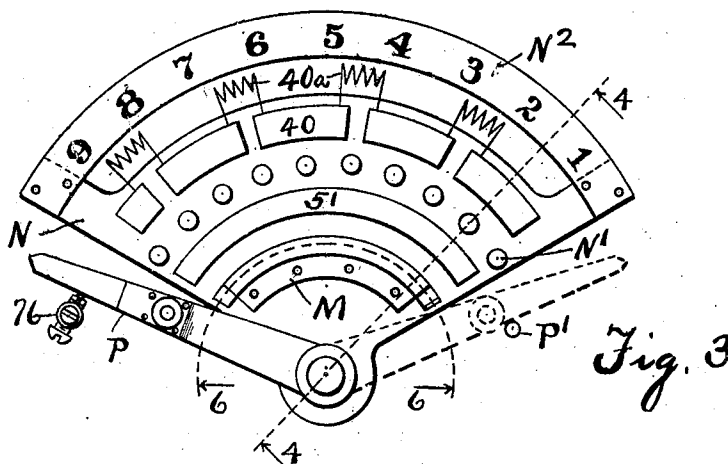


Fig. 3

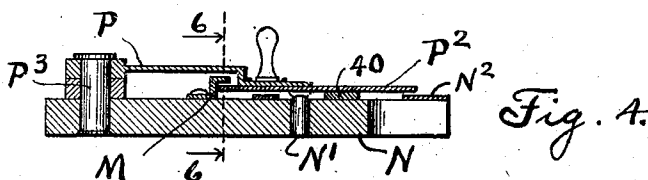


Fig. 4.

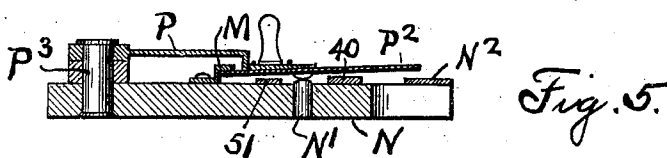


Fig. 5.

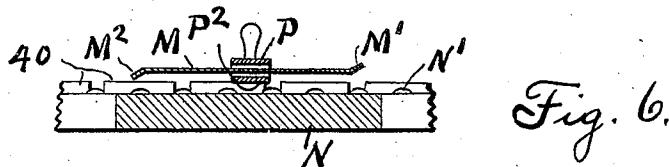


Fig. 6.

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UNITED STATES PATENT OFFICE.

NILS EMEL NORSTROM, OF CHICAGO, ILLINOIS, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO JOHN ANDERSON, OF SALINA, KANSAS, M. E. RICHARDSON, OF STERLING, KANSAS, AND JOHN H. MARTIN AND H. KEATING.

TELEPHONE-EXCHANGE.

No. 852,675.

Specification of Letters Patent.

Patented May 7, 1907.

Application filed April 6, 1901. Serial No. 54,594.

To all whom it may concern:

Be it known that I, NILS EMEL NORSTROM, a citizen of the United States of America, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Telephone-Exchanges, of which the following is a specification.

My invention relates to telephone exchanges and has for its object the arrangement of devices for use where a number of local stations are connected by a party line to a central station.

In calling any particular subscriber or subscribers in a elective party line exchanges which lays claim to simplicity and rapidity of operation and to locking out subscribers not wanted, it is necessary that at least two operations be performed at the station or stations called. One of these operations consists in selecting a desired station from among those not desired, and the other consists in connecting the selected station telephonically to the party line. In party line exchanges as ordinarily made, one of these operations must be performed by the subscriber himself. Thus, the operator at the central office performs certain operations by which she selects a station wanted. She then signals that station and waits for the subscriber to reply before she can complete the operations which will connect the called subscriber telephonically to the party line to the exclusion of subscribers not wanted. If the called and calling stations are both on the same line and if the called station is the first of the two selected, which is the case in about one-half of all such calls, the operator then has to proceed to call the second station after having waited for the called station to answer. Processes of this kind not only waste the time of the operator, who would naturally be busy in a central office from which emerge many party lines, but they divide the actual control of the line between the operator and the subscriber. Where control of the line is divided in this way it is possible for inquisitive subscribers, by taking advantage of certain particular times during a calling operation, to remove their receivers from their hooks and thus become telephonically connected to the party

line in opposition to the wishes of the operator and other subscribers.

The present invention is distinguished from prior exchanges in that the connection of one or more subscribers to the party line is in no way dependent upon operations performed by the subscribers themselves, and there is no occasion for the operator to wait for an answer before completing a call. By a continuous operation involving very little time, she selects and connects the desired stations. She then signals the stations and proceeds with other business without waiting for a reply. Subscribers not called are definitely cut out or excluded from telephonic connection with the line, because at their stations there are open connections, the open or closed condition of which is not involved, either directly or indirectly, with any operations performed by the subscribers.

In the accompanying drawings Figure 1 is a diagram illustrating at its left hand side the central office apparatus and electrical connections, and illustrating at its right hand side a local station marked No. 1. Fig. 2 is a diagram of two additional local stations marked respectively No. 2 and No. 3. Fig. 3 is a plan of the selecting switch shown in the diagram of Fig. 1. Fig. 4 is a section on line 4—4 of Fig. 3, the contact maker also being shown in section. Fig. 5 is a similar section with the contact maker at a slightly different position. Fig. 6 is a section on line 6—6 of Figs. 3 and 4.

In the said drawings N represents a plate of insulation on which is mounted the apparatus constituting the selecting switch. A contact maker P having an extension P², and secured to the plate N by the pivot P³, is movable between a contact making stop and another stop P¹. On the outer edge of the plate N is a segment of a dial N² marked with the figures 1, 2, 3 etc up to 9. Also on the plate are a series of pins N¹ so located with respect to the numbers on the dial that the numbers come in line with the spaces between the pins N¹. Between the arc formed by the pins N¹ and the arc of the numbered dial is a contact plate 40 divided into a series of sections which are connected together by resistance coils 40^a. The end P² of the contact maker P extends under a lip on a Z-

shaped bracket M, one end of which lip is turned up as shown at M¹ in Fig. 6, and the other end of which is turned down as shown at M². This bracket M and the inner lip of the extension P² are so related to each other that when the contact maker P is moved toward the right this lip rides over the top of the bracket M, while when it is moved toward the left, after having been moved to its extreme position against the stop P¹, it slides under the lip of the bracket M. When the contact maker P is moved toward the right and slides over the top of the bracket M, the said contact maker is raised clear of the pins N¹ and the contact plate 40, but when it moves in the opposite direction the said contact maker rides over the pins N¹, and as it passes down between each pin it touches the contact plate 40; thus when the contact maker P is between the first and second pins N¹ it points directly toward the figure 1 on the dial and touches the plate 40. Passing between 1 and 2 on the dial it rises over the second pin and breaks the connection with 40, which connection is repeated as soon as the contact maker arrives between the second and third pins and is pointed toward the figure 2 on the dial. Between the row of pins N¹ and the bracket M is another contact strip 51, so arranged that when the contact maker is at a position between two pins, if it be pressed downward electrical connection is made between the strip 51 and the contact maker, and consequently also between the strip 40 and the strip 51. The contact maker P is therefore capable of making either a single or a double contact as is desired, and such contact can be made when the contact maker points at any desired figure on the dial N². Also located at the central office is a spring jack illustrated by contact springs 13 and 14 located just above the switch N and the plug V adapted to be inserted in the said spring jack. Also at the central office there is a battery X, a bell ringing device Q, receiver R, induction coil K, transmitter T, battery Y, an alternating generator G and contact making keys 26, 59 and 78, also a drop magnet 16. These various parts are connected together by wires as is illustrated. At each local station there is a direct current generator G, a bell ringing device Q, receiver R, induction coil K, receiver hook H, a condenser 80 and magnets A, B, C and D which operate contact making devices as will be hereinafter described. These different parts are connected together as shown in the diagram. From the strips of the spring jack at the central office there extend two wires 50 and 100. The wire 50 extends past each one of the local telephone stations No. 1, No. 2, No. 3, etc, and is provided with a branch 18 leading to the magnet A of each station. The wire 100 terminates in the first station, and from this first station a wire 101 extends to

the second station where it terminates. From the second station a wire 102 extends to the third station, and so on.

Assuming that subscriber at telephone station No. 1 wants to talk with subscriber at telephone station No. 3, then he proceeds as follows: He removes his receiver R from its hook and turns the crank of his generator which sends a direct current as follows: G—9—10—11—ground to the central office—12—13—14—15—16—17—50—back to the local station—18—19—Q—20—21—G. This operates the drop at the central office and calls the operator there. The subscriber presses his listening key 35 and the central operator inserts the plug V in the spring jack and presses her listening key 26. The talking circuit between the central office and telephone station No. 1 is then as follows: beginning at K of the local office 22—R—23—19—18—50—to the central office—17—24—14—plug V—25—26—27—28—R—29—K—30—31—32—12—ground back to the local station—11—33—34—35—36—H—37—38—K. When informed that the subscriber at station No. 3 is the one wanted the operator of the central office moves the contact maker P to the right to its extreme position and then returns it to the left, stopping on the way at the numbers indicated on the dial of the stations that are wanted. Thus the subscriber at station No. 1 wanting the subscriber at station No. 3, the operator moves the contact maker until it points at No. 1, then presses it downward, then moves it to No. 3, presses it downward again, and then returns it to the left in contact with the contact point 76. After passing over the first pin N¹ the contact maker P makes a contact with the strip 40 when a current flows as follows: from battery X—39—40—P—25—plug V—14—24—17—50 to 18 of the first station—A—41—42—43—44—100—back to the central office—45—plug V—46—47—X. The current through the magnet A releases the spring 42 from the hook on the armature 43 of the magnet A, thus breaking the circuit through the said magnet at this point, but prior to such breaking the armature 43 strikes a contact spring 48 making electrical connection therewith and also with a contact point 55. The spring 48 is in electrical connection with the spring 42 so that the said circuit is held through the magnet A until it is broken at the switch at the central station. When the circuit is broken at the central station the armature 43 falls back against a contact making stop 49 and in this position is not in electrical connection with either 42 or 48 and consequently the circuit is broken for magnet A at the first station and is completed from 100 to the extension 101 by way of 44, 43 and 49. Then when the contact maker P passes to the next space there will

be a similar current sent from the battery X, except that instead of passing from the branch 18 of the first station it will go to the branch 18 of the second station through the magnet A of that station and back over the line 101 to 102, following the same previously mentioned course, the result of which action will be to connect the line 102 with the line 101 by way of 49, 43 and 44. By this continued process the connection is extended from station to station for any required distance. When, however, the contact maker P is pressed down so as to make electrical connection with the strip 51, as in this case occurs for the first station and the third station, then for the first station a circuit will flow as follows: (remembering of course that the current is meanwhile held through the magnet A) X—39—40—P—51—52—12—ground to local station—11—53—B—54—55—48—43—44, where it joins the other circuit through magnet A and returns over the previous course to the battery X. The current through magnet B releases the spring 63 from the hook on the armature lever 73, permitting the said spring to drop back in contact with contact point 64. The breaking of the circuit through the magnet B permits the armature 73 to connect with the contact point 72. The same operation which is just described for station No. 1 is repeated for station No. 3 whereby a current is sent through the magnet B of that station. In all of the other stations on the party line no current is sent through the magnet B, but they are disconnected by the operation of the magnets A of the respective stations. As the stations on the line are at different distances from the central office, it will be evident that the resistance on the line will be a variable one, and therefore for the purpose of making the resistance of the current from the battery X approximately even, the contact plate 40 is divided up into sections and the resistance coils 40^a which connect them are supposed to represent an amount of resistance equal to the resistance between stations. In the drawings the resistance is not located at each station contact, but one resistance coil is put in for each two stations, which will ordinarily be a near enough approximation to the actual resistance of the line. Thus at station No. 1 which is assumed to be the nearest to the central office, the current passing from the battery X has to travel all of the resistance coils connecting the sections of the strip 40, whereas at station No. 9 there would be no resistance at the central office, and the total resistance would be the resistance of the line.

To call the subscriber wanted the operator at the central office presses the key 59 and turns a generator G, when a current flows as follows: G—56—57—58—59—60—25—plug V—14—24—17—50—to 18 of the third station—19—Q—20—61—H—36—62—63—64—65—102—49 of the second station—43—44—101—49 of the first station—43—44—100—45—plug V—46—66—67—68—69—G. This rings the bell of the third station and calls the subscriber who removes his receiver. The talking circuit between station 1 and station 3 is then as follows: beginning at K of station No. 1—22—R—23—19—18—50—to 18 of station No. 3—19—23—R—22—K—38—37—H—36—62—63—64—65—102—49 of station No. 2—43—44—101—49 of station No. 1—43—44—65—64—63—62—36—H—37—K. When through talking the subscriber rings off before returning the receiver to its hook and from the generator G a direct current flows, 9—70—71—72—73—74—62—63—64—65—100—45—plug V—46—Q—75—76—P—25—plug V—14—24—17—50—18—19—Q—20—21—G. This informs the operator at the central office that the subscribers are through talking, and the operator presses the key and turns the crank of a generator which is of the alternating current type, when a current flows as follows: G—56—57—77—78—60—25—plug V—14—24—17—50—18 of each station—19—79—C—condenser which does not stop an alternating current but does stop a direct current—11—ground back to the central office—12—81—82—83—84—69—G. The current through the magnet C closes the armature 87 to the contact point 86 at each station when a current flows as follows: from the battery Z—85—86—87—88—D—62—Z. The current through the magnet D operates its armature on which armature are pins adapted to return the springs 42 and 43 to their normal position in contact with the hooks on the armatures 43 and 73. In this position the devices at all the stations are returned to their normal position.

What I claim is:—

1. The combination with a central office, a series of local stations, and a discontinuous conductor extending from the central office to the first station and thence from station to station, of two contact makers at the central office, means whereby upon making a series of contacts by one of said contact makers the sections of conductors will be united one by one into a continuous conductor, and means whereby upon making a contact with the second contact maker simultaneously with a contact made by the first contact maker the station corresponding to the section then being united will be telephonically connected to the continuous conductor.
2. A telephone selecting switch provided with two contact strips, a movable contact maker, means whereby a movement of said contact maker in one direction will cause it to make a series of contacts with one of said strips, means whereby a pressure upon said

contact maker will extend the contact of said contact maker to the other contact strip, and means whereby a movement of said contact maker in the opposite direction will act to prevent said contact maker from making contacts with either strip.

3. The combination with a central telephone station, a series of local stations, electrically operated devices at each local station, and party line wires connecting the devices of the local stations to said central station, of a battery and a contact maker at the central station connected to said wires, means whereby the making of a series of contacts by said contact maker the devices of the local stations will be operated one by one to cut the said local stations out of telephonic connection with the central station, and means whereby upon making a second contact while one of the series of contacts is maintained additional parts of the devices at the corresponding local station will be operated so as to retain that station in telephonic connection with the central station.

4. The combination with a central station, a series of local stations, and conductors connecting the stations, of devices located at the central station for making either single or double electrical contacts, means whereby upon making a series of single contacts the local stations will be excluded one by one from telephonic connection with said conductors, and means whereby upon making a double contact in the series of contacts the corresponding local station will be placed in telephonic connection with said conductors.

5. The combination with a central office, a party line, and a series of local stations, of means by which upon sending a series of impulses from the central office over the party line, the local stations will be excluded from telephonic connection with the line one by one in the order of the impulses sent, and means by which upon sending a secondary impulse with one of the impulses of said series, the station corresponding to that impulse will be placed in telephonic connection with the line.

6. The combination with a central office, a series of local stations, and a party line, of two contact makers at the central office, means whereby upon making a series of contacts by one of said contact makers the said stations will be selected one by one, and means whereby upon making a contact with the second contact maker simultaneously with a contact made by the first contact maker, the station selected at the time will be telephonically connected to the party line.

7. The combination with a central telephone station, a series of local telephone stations, and a party line connecting the local stations to the central station, of a selecting contact maker located at the central station and capable of making either single or double

electrical contacts, means whereby upon making a series of single electrical contacts with said contact maker each such contact will cut out a corresponding local station from telephonic connection with said party line, and means whereby the making of a double electrical contact with said contact maker each such double contact will bring a corresponding local station in telephonic connection with said party line.

8. The combination with a central office, a series of local stations, and normally disconnected sections of conductors extending from station to station, of devices at each station for connecting the ends of conductors terminating thereat, other devices also at the stations for placing them in telephonic connection with the connected conductors, and means under the exclusive control of the central office for causing the operation of one or both devices at each station.

9. The combination with a central office, a series of local stations, and a party line, of a calling device located at the central office and arranged to make either single or double electrical contacts for the stations in succession, means by which each station for which a single electrical contact is made will be excluded from telephonic connection with the party line, and means by which each station for which a double electrical contact is made will be placed in telephonic connection with the party line.

10. The combination with a party line, a series of local stations, means for sending a series of impulses over the line, and means for associating a second impulse with any one impulse of said series, of devices at each station operated by said impulses, means by which upon sending such series of impulses said devices will be operated so as to exclude the stations from telephonic connection with the line one by one in the order of the impulses sent, and means by which upon sending an extra impulse with any one of the series of impulses the devices of the corresponding station will be operated so as to place that station in telephonic connection with the party line.

11. The combination with a party line, and a series of local stations, of means by which upon sending a series of impulses over the party line corresponding in number to the number of stations each impulse in its order will cause the corresponding station to be cut off from telephonic connection with the line, and means by which upon coupling a secondary impulse with any one impulse of the series of impulses the station corresponding to that impulse will be placed in telephonic connection with the line.

12. The combination with a series of stations, and a party line, of a magnet at each station for connecting it telephonically to the party line, a circuit for each magnet arranged

so as to exclude all contacts made by the subscribers at their stations, means for connecting said circuits successively and temporarily to said line, and means for sending
5 impulses through a plurality of selected ones of said circuits at the times when they are temporarily connected to said line whereby the magnets in said circuits are operated to connect desired stations telephonically to the
10 party line.

13. The combination with a party line, and a series of local stations each potentially capable of being telephonically connected to the line, of means by which upon sending a
15 series of impulses over the line corresponding

to the stations thereon each impulse in its order will cut off the capability of the corresponding station to be telephonically connected to the line, and means by which upon
20 sending a secondary impulse with any impulse of the series of impulses the station corresponding to the selected impulse will be telephonically connected to the line.

Signed at Chicago, Ill. this 28th day of March 1901.

N. EMEL NORSTROM.

Witnesses:

CHAS. O. HATCH,
WILLIAM M. ROBERTS.