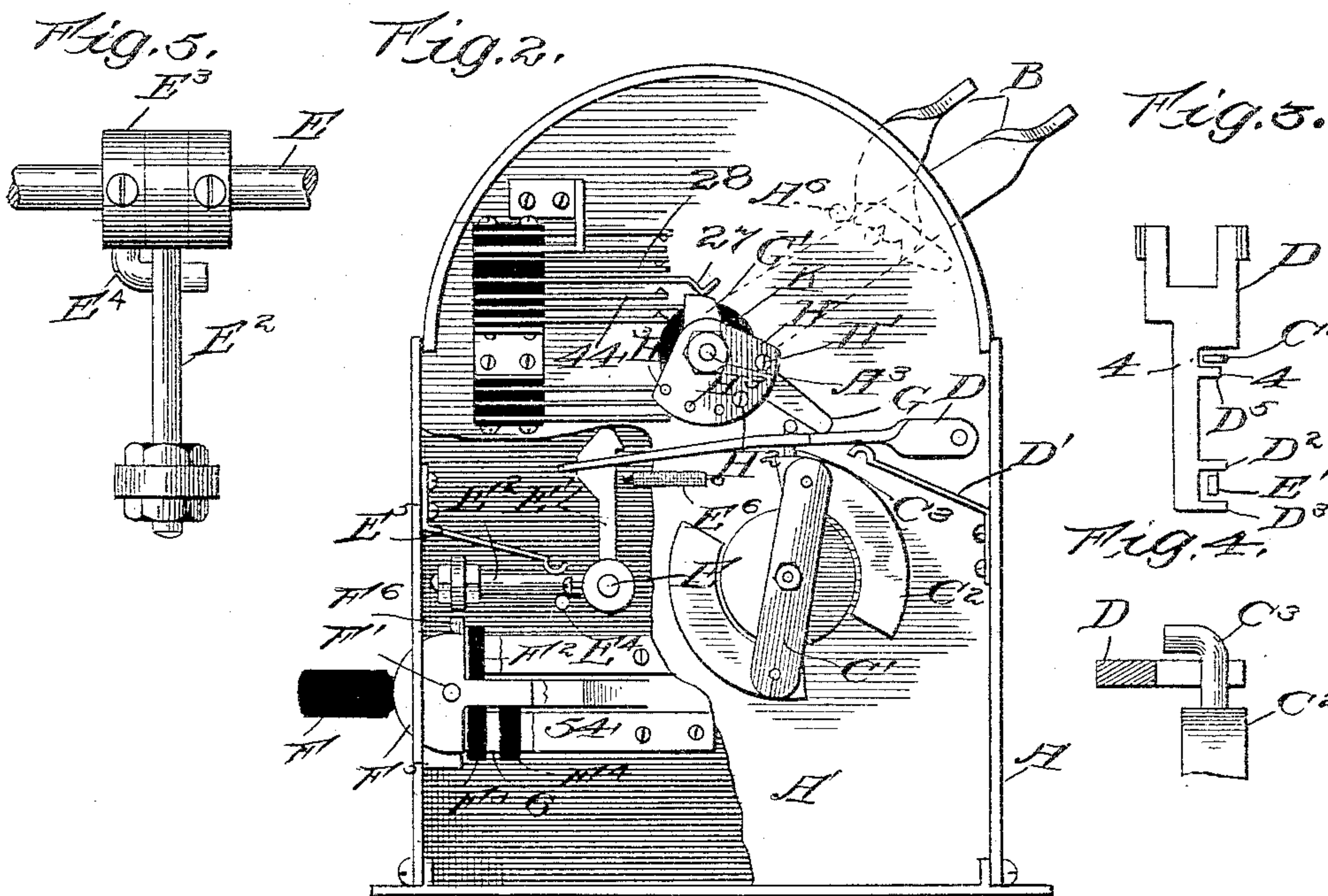


CALLING DEVICE FOR TELEPHONE EXCHANGES.

APPLICATION FILED NOV. 16, 1904. RENEWED FEB. 10, 1909.

Patented Sept. 28, 1909.

2 SHEETS—SHEET 1.



Inventor:  
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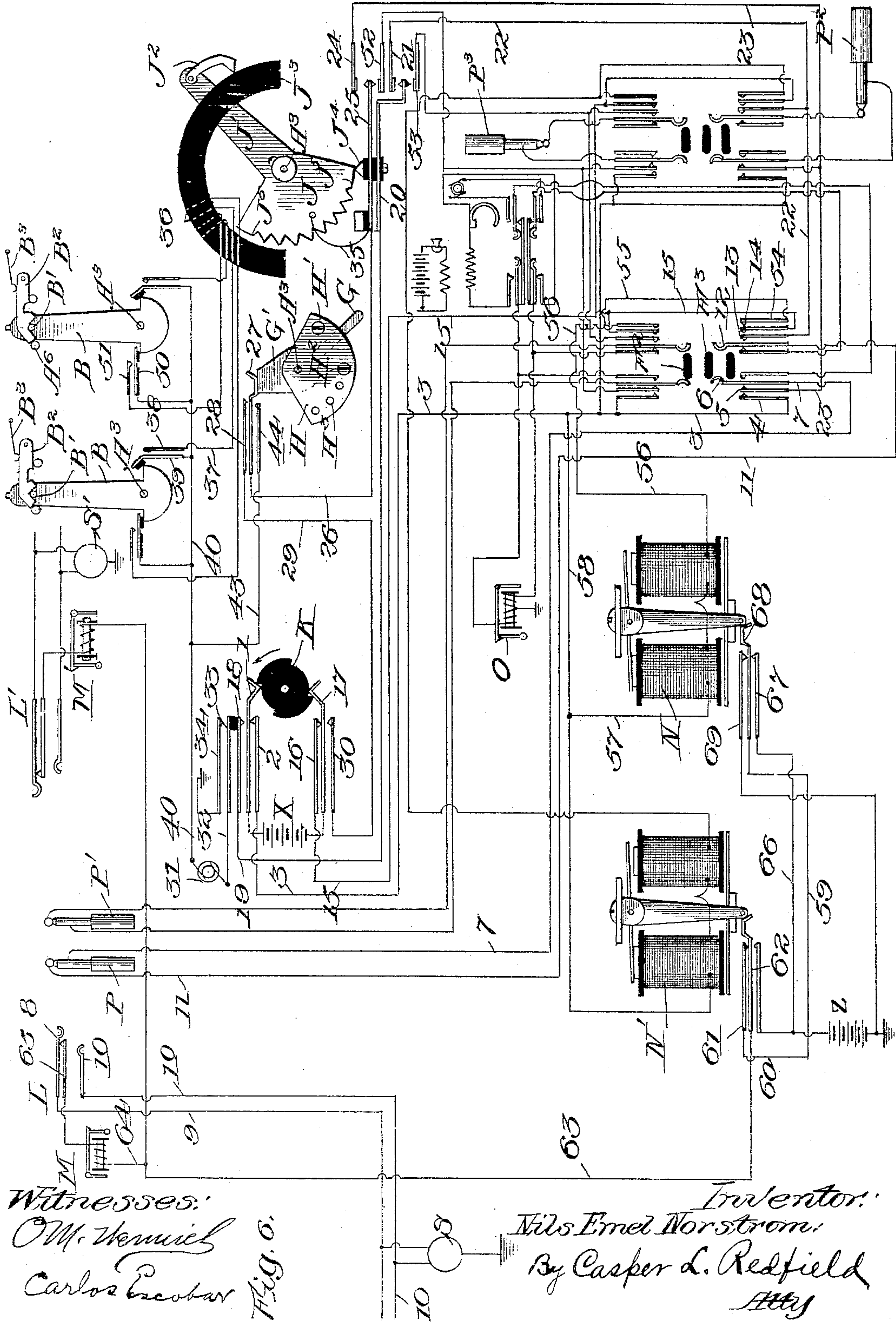
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2 SHEETS—SHEET 2.



Witnesses:  
O. M. Venniel  
Carlos Escobar

Fig. 6.

Inventor:  
Nils Emel Norstrom.  
By Casper L. Redfield  
Att'y



# UNITED STATES PATENT OFFICE.

NILS EMEL NORSTROM, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE ANDERSON ELECTRIC AND MANUFACTURING COMPANY, A CORPORATION OF KANSAS.

## CALLING DEVICE FOR TELEPHONE-EXCHANGES.

935,049.

Specification of Letters Patent. Patented Sept. 28, 1909.

Application filed November 16, 1904, Serial No. 232,911. Renewed February 10, 1909. Serial No. 477,220.

*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 Calling Devices for Telephone-Exchanges, of which the following is a specification.

My invention relates to calling devices for telephone exchanges, and more particularly for party line exchanges.

In the kind of exchanges for which my invention is especially applicable there is a central office from which run a series of party lines and on each party line there are a series of local stations. Each station is provided with the ordinary telephoning apparatus such as receiver, transmitter, bell ringing device etc. Each also has certain electrically operated devices by which the station is telephonically connected to the party line or is cut off from such connection. These devices are operated by electrical impulses sent from the central office and the object of my invention is improvement in the devices for sending these impulses.

The electrically operated devices, or switches, at the local stations may be of any desired kind. In a form which I have used the electrically operated device consists of a contact maker that is moved by means of a magnet and a ratchet wheel. In the path of the contact maker is a contact point, and in the different stations on a party line this contact point is at a different distance from the normal position of the contact maker. When the calling device sends out impulses over the party line, they move all of the station devices equal distances. The first impulse brings the contact maker of the first station in connection with its contact point. The second impulse breaks this connection and brings the contact maker of the second station to its contact point. The third impulse breaks the connection at the second station and makes it at the third, and so on. At each station there is a second magnet so arranged that if it is operated the receiver of that station is connected to the party line, but if it is not operated the receiver is left disconnected. The second magnet of each station is connected to the contact point that lies in the path of the contact maker, and the arrangement is such that if the calling device at the central office sends a second im-

pulse when the contact maker of a station is on its contact point that station will be telephonically connected to the party line. It is part of the office of the calling device to send these second impulses over a proper circuit to two stations either on the same line or on different lines by a single operation. Each station is so arranged that when its receiver is hanging on its hook its bell ringing device is connected on one side to one branch of the party line, and on the other side to ground. When the receiver is removed for talking the ground connection is cut out. These various things relating to the local stations do not form a part of the present application, but a brief description of them is inserted for the purpose of indicating the results that are produced by the impulses sent when the calling device is operated.

In the accompanying drawings, Figure 1 is a front elevation of the calling device, part of the inclosing case being broken away so as to show the interior. Fig. 2 is an end elevation with the outside end plate removed and part of the interior plates broken away. Fig. 3 is a detail in plan of the governor locking lever; Fig. 4 is an enlarged section on line 4—4 of Fig. 3; Fig. 5 is an enlarged detail; and Fig. 6 is a diagram showing the electrical connections for the calling device, the operation of some of its parts, and the relationship of some of the other central office devices to the calling device.

In the said drawings A is a casing in the interior of which are plates A<sup>1</sup> and A<sup>2</sup>.

Running longitudinally through the casing A, and partly supported by the plates A<sup>1</sup> and A<sup>2</sup> is a shaft A<sup>3</sup> on which is a spring A<sup>4</sup> which acts to return the parts to normal position when they have been moved by hand. Several of the other parts mounted on the shaft A<sup>3</sup> are shown spread out in the diagram and will be described hereinafter.

Screwed to the shaft A<sup>3</sup> is a lever A<sup>5</sup> which carries one end of a bar A<sup>6</sup>. The other end of this bar is supported in another lever (not shown) of the same kind which is secured to the other end of the shaft. These levers and the rod are in the nature of a bail by means of which the shaft A<sup>3</sup> may be turned.

Loosely mounted on the shaft A<sup>3</sup> are a series of numbered levers B which rest behind the bar A<sup>6</sup> and operate through slots A<sup>7</sup> in



the top of the casing A. When one of the levers B is pulled forward by hand, it strikes the bar A<sup>6</sup> and turns the shaft A<sup>3</sup>.

Secured to the shaft A<sup>3</sup> is a ratchet wheel A<sup>8</sup> which coöperates with a pawl (not shown) on the gear A<sup>9</sup>, which gear meshes with a pinion C on the governor C<sup>1</sup>. The gear A<sup>9</sup> is loose on the shaft A<sup>3</sup> and the ratchet mechanism is so arranged that when the shaft A<sup>3</sup> is moved against the action of the spring A<sup>4</sup> by moving a lever B, the pawl rides over the ratchet wheel, but when the spring returns these parts to their normal position the ratchet wheel drives the gear A<sup>9</sup> and hence the governor C<sup>1</sup>.

On one of the governor weights C<sup>2</sup> is a hooked pin C<sup>3</sup> which engages and is stopped by a shoulder on the lever D, which lever is pivoted at a convenient place on the plate A<sup>1</sup>. A spring D<sup>1</sup> acts to raise the lever D, and an arm G fast to the shaft A<sup>3</sup> acts to depress the lever D against the spring D<sup>1</sup> when the shaft is at its normal position. When the shaft A<sup>3</sup> is moved away from its normal position the arm G moves away and permits the lever D to rise except as stopped as hereinafter described.

Secured to a shaft E is an arm E<sup>1</sup> which projects between the lugs D<sup>2</sup> and D<sup>3</sup> of the lever D. (See Figs. 2 and 3.) The upper end of the arm E<sup>1</sup> has a hook that engages the lug D<sup>2</sup> and stops the lever D from more than a limited rise under action of spring D<sup>1</sup> until this hook is subsequently released.

Pivoted at F<sup>1</sup> in the front of the casing A are a series of keys F each of which is provided with insulated projections F<sup>2</sup> on one side and F<sup>3</sup> and F<sup>4</sup> on the other side. These projections lie between springs as shown in Fig. 6, and the action of these springs is to hold the key at its mid-position, or to return the key to mid-position after it has been moved. The disk part F<sup>5</sup> of each key F is provided with a pin F<sup>6</sup>.

Loosely mounted on the shaft E are a series of arms E<sup>2</sup> provided with heads which are normally supported just above the pins F<sup>6</sup>. Adjacent to each arm E<sup>2</sup> there is secured to the shaft E a collar E<sup>3</sup> provided with a pin E<sup>4</sup> that projects under the arm E<sup>2</sup> and serves to support it until said shaft is moved. At a convenient place is a spring E<sup>5</sup> that presses on the arm E<sup>2</sup> and tends to turn the shaft E in one direction, while at another place is a weaker spring E<sup>6</sup> that engages arm E<sup>1</sup> and acts to move the shaft in the opposite direction.

When a lever B is moved forward the spring A<sup>4</sup> is wound and the arm G moves away from the lever D, which lever rises until caught by the hook on the arm E<sup>1</sup>. This rise is not enough for the lever D to clear the pin C<sup>3</sup> on the governor C, consequently the spring A<sup>4</sup> is restrained and the moved lever B does not return to normal po-

sition. When the lever D rises the lug D<sup>3</sup> thereon slides part way up on the beveled head of the arm E<sup>1</sup>. This permits the spring E<sup>5</sup> to overcome the spring E<sup>6</sup> and move the shaft E. Contact between the head on the arm E<sup>2</sup> and the pin F<sup>6</sup> prevents this movement being enough to release the hook on arm E<sup>1</sup> from the lever D. If now the key F be depressed the pin F<sup>6</sup> will be moved away from arm E<sup>2</sup> and that arm will fall carrying with it the arm E<sup>1</sup> and releasing the lever D. This releases lever D from pin C<sup>3</sup> and permits the governor C to turn under action of spring A<sup>4</sup>, and consequently permits the lever B to return to its normal position. Upon this return the lever G again strikes lever D forcing it down into the path of the pin C<sup>3</sup> thus stopping the governor C. In the depressed movement of the lever D the lug D<sup>3</sup> thereon engages the beveled head of the arm E<sup>1</sup>, thus returning that arm to its original position and carrying with it the arm E<sup>2</sup> against the action of the spring E<sup>5</sup>. At the time the key F was depressed the head on the arm E<sup>2</sup> dropped behind the pin F<sup>6</sup> and thus prevented the springs acting upon insulated projection F<sup>3</sup> from returning the key to its normal position. When the arm E<sup>2</sup> rises under the action just described, its head clears the pin F<sup>6</sup> and permits the springs 6 and 12 acting upon the projection F<sup>3</sup> to return key F to its normal position. On the other end of the arm G is an arm G<sup>1</sup> which in its normal position engages a spring 27 and holds it midway between, and out of connection with, two adjacent springs. When the shaft A<sup>3</sup> is moved the arm G<sup>1</sup> leaves spring 27 and permits it to contact with spring 44.

Loosely mounted on the shaft A<sup>3</sup> is a section of a disk H having therein pins H<sup>1</sup> and H<sup>2</sup>, and some holes H<sup>3</sup> to any one of which the pin H<sup>2</sup> may be adjusted. The arm G lies between the pins H<sup>1</sup> and H<sup>2</sup> and strikes one or the other of them when it is moved. In turning the shaft A<sup>3</sup> by manipulating a lever B, the lever G<sup>1</sup> first leaves spring 27 and then the lever in turning the disk H causes said disk to engage said spring. The radius of the disk H is a little greater than the radius of the lever G<sup>1</sup>, hence said disk moves spring 27 into contact with spring 28. When the lever G returns to normal position it moves from pin H<sup>1</sup> to pin H<sup>2</sup> before it moves disk H from spring 27. This gives a certain amount of lost time during which springs 27 and 28 are in connection with each other, and the amount of this lost time depends upon which hole H<sup>3</sup> contains the pin H<sup>2</sup>. Also on the shaft A<sup>3</sup> is secured a section of a toothed wheel J having a surface of uniform radius at each end of the toothed part. Supported adjacent to the toothed wheel J are two springs 25 and 20, secured together but insulated from each



other. One of these carries an insulated projection  $J^4$  adapted to be engaged by the teeth of the wheel  $J$  when said wheel is moved. When such movement occurs the  
 5 said springs make and break connections with adjacent springs as will be hereinafter described.

Forming part of the wheel  $J$  is an arm  $J^1$  which carries a contact maker  $J^2$  adapted  
 10 to engage a series of contact points mounted on a block of insulation  $J^3$ . These contact points are connected by wires to contact springs that lie adjacent to the levers  $B$  as shown in Fig. 6.

15 At any convenient place on the shaft  $A^2$  is secured a pole changing block of insulation  $K$  which is of about the shape and proportions shown in Fig. 6. When the shaft  $A^2$  is moved the block  $K$  shifts the adjacent  
 20 springs so as to change the connection from one side to the other side of the battery  $X$ .

The length of the movement of the block  $K$  is sufficient to cause the springs in contact therewith to move over the entire length of  
 25 the raised portion and to fall into the opposite depressed portion.

Adjacent to each lever  $B$  is a small lever  $B^2$  provided with notches in its under side, either of which is adapted to engage a pin  
 30  $B^1$  on the lever  $B$ .

A small spring  $B^3$  holds the lever  $B^2$  on the pin  $B^1$ . When the rod  $A^6$  is at its normal position it strikes the beveled end of the lever  $B^2$  and raises said lever slightly. When  
 35 the rod  $A^6$  is away from its normal position by reason of a lever  $B$  having been moved the other levers  $B^2$  fall into contact with the pins  $B^1$  of the other levers  $B$ . It follows from this that when one of the levers  $B$  has  
 40 been moved forward, some other lever  $B$  may be moved backward a limited distance and will be held in the backward position by the inner notch in the adjacent lever  $B^2$ . When the rod  $A^6$  returns to normal position  
 45 it releases the lever  $B^2$  from the pin  $B^1$  and permits the lever  $B$  to move forward to its original position. This last movement is effected by the contact springs 50 and 51 which are closed together by a backward  
 50 movement of the lever  $B$ , but which separate by their resiliency when not restrained.

In Fig. 1 there are shown six keys  $F$ , but the diagram shows only the springs and connections for two of them. The other keys  
 55 have, of course, similar springs and connections. For each key  $F$  there is a pair of cords terminating in plugs  $P$ ,  $P^1$  etc. The connections are illustrated in the diagram and will be explained hereinafter.

60 Each party line terminates in a spring jack  $L$ ,  $L^1$  etc., and has associated therewith a line drop  $M$ ,  $M^1$  etc. For each pair of cords there is provided a polarized magnet  $N$ ,  $N^1$  etc., which is bridged between the two  
 65 lines of the cord. These magnets are nor-

mally in the position shown, but when one of them is operated it connects the battery  $Z$  to a ground circuit including the line drops  $M$ . This matter will be further described hereinafter.

In addition to the devices already described there are a number of other devices associated therewith that are conventionally illustrated.

$S$  and  $S^1$  represent one station each on two  
 75 party lines, there being any desired number on each line.

Further description of the device will be best given by describing its operation in the  
 80 calling of two stations either on the same line or on different lines. Let us assume that a subscriber at some station, as  $S$ , has operated a generator thereat and has sent an impulse through the associated drop  $M$ . Let us assume also that the operator has an-  
 85 swered the call in the ordinary way and has learned that the subscriber at station No. 9 wishes to talk to the subscriber at station No. 19. The operator inserts a plug, as  $P$ , in the jack  $L$  of the line on which the sta-  
 90 tions are located; pulls forward the levers  $B$  that are marked "9" and "19"; and presses downward the key  $F$  that is associated with the cord that runs to the plug used. When the subscriber rings off the op-  
 95 erator again presses key  $F$ , removes plug and restores drop. These complete the manual operations and leave the device in normal position.

In pulling forward one of the levers  $B$ ,  
 100 the spring  $A^4$  is wound up, the disk  $H$  has taken the place of the lever  $G^1$  and has moved spring 27 to contact with spring 28, and the lever  $G$  has moved away from the  
 105 lever  $D$  so that the only thing that now holds  $D$  from rising and releasing the governor is the catch on the arm  $E^1$ . The toothed segment  $J$  has been moved to the other extreme of its position with the other blank portion  
 110  $J^5$  on the projection  $J^4$ , and the contact maker  $J^2$  rests at the other end of the row of contact points on the block  $J^3$ . The pole changing block  $K$  has been moved in the di-  
 115 rection of the arrow so that the springs in contact therewith now rest in the opposite depressed portions. Also the turning of the lever  $B$  on its pivot resulted in closing spring 39 to spring 38, one of which is connected to a contact point on the block  $J^3$ .

When the second lever  $B$  is moved the  
 120 only thing it does is to close its spring to its contact point on block  $J^3$ . The reason for this is that all of the other operations had been performed by the first key moved and the only thing left to be done by the second  
 125 key moved is the closure of its contact springs to its contact point. As the keys moved are Nos. 9 and 19 the connections will be to the ninth and nineteenth contacts  
 130 on the block  $J^3$ .



When the key F is depressed the projection F<sup>3</sup> spreads the springs 6 and 12 moving them from the springs between them to connection with the springs on the outside of them.

The depression of the key F permits arm E<sup>2</sup> to fall behind pin F<sup>6</sup> and lock key F in the moved position. The falling of the arm E<sup>2</sup> turns the shaft E and frees the catch on the arm E<sup>1</sup> from the lug D<sup>2</sup> on lever D. Freeing this catch permits lever D to rise and free pin C<sup>3</sup> on governor C. When this occurs the spring A<sup>4</sup> acts to return the moved parts to their normal positions, the governor acting to regulate the speed of this return movement.

Upon first depressing key F a current flows:—X—1—2—3—4—5—6—7—8—9—all of the stations on the line—10—11—12—13—14—15—16—17—X. This circuit is complete only for an instant because, as the pole changing block K begins to turn in the direction opposite to the arrow on its way back to its normal position, the raised portions separate the springs 1 from 2 and 17 from 16, thus cutting off the connection to the springs adjacent to F. The making of this circuit occurs before the moved parts start on their return movement, and the breaking of the circuit occurs while the smooth part J<sup>5</sup> of the toothed segment J is in contact with the projection J<sup>4</sup> and before the teeth reach said projection. The relationship of this circuit to the electrical devices of the stations is in the nature of a release, and its object to be sure that all switching mechanisms are at their normal positions before starting them to move by the circuits that now follow.

Immediately after the pole changing block K has moved springs 1 and 17 outward the segment J has moved far enough for the projection J<sup>4</sup> to drop into the notch adjacent to the first tooth. This closes 20 to 21 and 25 to 24, when a current flows:—X—1—18—19—20—21—22—13—12—11—10—all stations on the line—9—8—7—6—5—23—24—25—26—27—28—29—30—17—X. This is the current for operating the electrically operated devices or switches of the different stations to move their contact makers as before mentioned, and this current is repeated for each space between the teeth of the segment J. As the segment J moves as just described the contact maker J<sup>2</sup> sweeps over the contact points on the block J<sup>3</sup>, and when it reaches the contact point connected to the moved lever No. 9 a second current flows from the generator 31—32—33—34—ground to that station which has its contact maker at the time on its contact point which station is pre-arranged to be No. 9—9—8—7—6—5—23—24—25—35—J—J<sup>2</sup>—36—37—38—39—40—generator 31. This is the current which is intended for the previously mentioned

second magnet of the station and operates to connect the station telephonically to the party line. It is described for station No. 9 and is repeated for station No. 19 because we have assumed that the key for that station has been similarly moved.

When the arm G strikes the pin H<sup>2</sup> and moves the segment H away from the spring 27 and permits said spring to connect to spring 44 a current flows from generator 31—40—43—44—27—26—25—24—23—5—6—7—8—9—the stations which have been connected telephonically to the party line—ground—34—33—32—generator 31. This is a current intended to signal the stations which have been telephonically connected to the party line and it continues for the remainder of the return movement of the calling device.

At the end of the return movement the arm G strikes the lever D and forces it down into the path of the pin C<sup>3</sup> thus stopping the governor C with the moved parts at their normal position. In the downward movement of the lever D the lug D<sup>3</sup> engages the beveled head of the arm E<sup>1</sup> to move it inward and to raise the arm E<sup>2</sup> away from the pin F<sup>6</sup> so that the springs 6 and 12 acting upon projection F<sup>3</sup> will return F to normal position. When the key F thus returns to its normal position it permits the springs 6 and 12 to move out of electrical connection with the adjacent springs 5 and 13. As these last springs are those through which the party line is connected to the contact makers of the calling device, it is evident that the automatic return of the key F to its normal position results in automatically disconnecting the line from the calling device. When through talking the subscriber rings off sending an impulse through the clearing out drop O. The operator then again presses key F sending another release impulse through the station so as to return their moved devices to their normal positions.

The operation so far described is that of calling two stations on the same line. In case they had been on different party lines, say station S wants to talk to station S<sup>1</sup>, then plug P would have been inserted in spring jack L, and the connected plug P<sup>1</sup> would have been inserted in spring jack L<sup>1</sup>. Also the operator would have moved one of the levers B forward as previously described and the other lever B backward so that its pin B<sup>1</sup> would be caught and held by the inner notch in the lever B<sup>2</sup>. This last action would close the springs 50 and 51 instead of the springs 38 and 39. Also, instead of pressing the key F downward as previously described, the operator would press it upward. The only change produced by this difference of movement is that projection F<sup>4</sup> instead of projection F<sup>3</sup> would spread the springs 6 and 12, while the projection



$F^2$  would similarly spread the corresponding springs on the other side. These last springs are connected to the plug  $P^1$  and to the springs 52 and 53 in the same way that the springs adjacent to  $F^3$  are connected to the plug  $P$  and the springs 21 and 24.

As previously described, the springs 38 are connected to contact points on the block  $J^3$ . These contact points are spaced so that  $J^2$  will touch one of them each time that the projection  $J^4$  falls into a space between the teeth on  $J$ , and consequently at each time that the springs 20 and 25 connect to the springs 21 and 24. The springs 51 for the levers  $B$  are connected to contact points on  $J^3$  that are spaced alternately with those connected to springs 38. The result of this is that  $J^2$  touches the contact points for springs 51 at the times when the projection  $J^4$  is riding over the apex of teeth on  $J$ , and consequently at times when springs 20 and 25 are in connection with springs 53 and 52. By the operations thus described it will be seen that the calling device is arranged to send the desired impulses over either one line or over two lines according as the desired stations are on the same or on different lines, and that it accomplishes either result by a single operation. In other words, the calling device is capable of operating over two lines simultaneously.

By referring back to the circuit for operating the electrical devices of the stations it will be seen that this circuit includes the springs 5 and 13. By the movement of the key  $F$  that made this circuit possible 5 was connected to 4, and 13 was connected through 14 to 54. There is a bridge between these by way of 54—55—56— $N$ —57—58—3—4. From this it will be seen that when operating impulses are sent over the line containing station  $S$ , such impulses also operate the polarized magnet  $N$  connected to the cord used. This operation moves spring 68 from spring 69 to spring 67. The pin in the armature lever of magnet  $N$  rests on the flat part of spring and holds this connection until an impulse is sent in the opposite direction through  $N$ . By observing the so called release circuit, it will be seen that it flows in the opposite direction over the wires of the same cord, and that this reversed direction is due to the changed position of the block  $K$  which shifts the connections of the springs 1 and 17. Hence, when the operator presses key  $F$  the second time to release the station devices, she also returns the polarized magnet to its normal position.

Let us now suppose that after the subscriber had rung off the operator had removed plug  $P$  but had forgotten to operate the key  $F$  to release the station devices. By referring to the signaling circuit previously described, it will be seen that it goes from line 9 through the station that has been tele-

phonically connected to the party line to ground. With a station thus connected a current will flow:— $Z$ —66—67—68—59—60—61—62—63—64— $M$ —65—8—9—station—ground— $Z$ . With this current flowing through the drop  $M$  the operator cannot make the shutter of the drop stay up and consequently she will or can know by this form of signal that she has forgotten to release the line.

From the foregoing description it will be seen that this calling device has a series of novel features part of which may be re-enumerated for the purpose of directing special attention to them. By moving one of the numbered levers, which may with equal propriety be called numbered keys, the calling device is not only wound up but is set for the selection of a station having a number corresponding to the number of the key.

By permitting the moved lever or key to return to normal position the station for which it was originally set is not only automatically placed in a telephonic connection, but is automatically signaled. In regard to this automatic signaling it may be well to point out that the signaling starts immediately after the lever  $G$  strikes the pin  $H^2$  and continues to the end of the return movement. The length of time during which the signal is sent is determined by the position of the pin  $H^2$ , and this position is in turn determined by the greatest number of stations on any one party line that is served by the calling device. In the drawing, the distance between  $H^1$  and  $H^2$  is supposed to represent a maximum of eight stations on some one or more of the party lines. In case some line should have more than eight stations, then  $H^2$  will be moved to some other hole  $H^3$ .

Another feature of importance is the means by which the device operates simultaneously over two lines. This saves much time in operation and an important part of the means by which it is accomplished are the double contacts made by the springs 20 and 25, and the intermediate arrangement of contact points on  $J^3$ . Another important part of this double operation is a key  $F$  which when moved in one way causes an operation over one line but which when moved in the other way causes an operation over two lines. This last is the means by which two kinds of operation are simplified for the convenience of the operator.

Another feature is the automatic signaling or indicating to the operator when a line has not been properly released. This is accomplished by the drops for the lines and the magnets  $N$ ,  $N^1$ , etc., which are located at any convenient place inside of the casing  $A$  and are connected up in the manner shown.

Another feature of considerable importance is a pole changer ( $K$  and its associated springs) so arranged that upon operating



the device a releasing impulse is sent over the line before the actual operation begins. This last is associated with the means by which the ringing or signaling circuit is opened up immediately before the device stops.

Another feature to which reference has not been previously made relates to the multiple operation of the calling device. Although there is but one set of devices operated by the levers B, there are several keys F each of which is supplied with cords and plugs. As soon as two stations on the same or different lines, have been placed in telephonic connection with each other by the return of the device to its normal position, and while they are talking, the device may be used to call other stations on other lines without interfering with those talking. In fact, with six keys F, the operator may have from six to twelve lines in simultaneous operation, and may connect and release them in pairs or singly without any operation on one line or on a pair of lines interfering with any of the other lines. This comes from the fact that the movements of the levers B affect nothing except when a key F is depressed, and then they affect only the line or lines which are connected to the cords for that key.

By referring to Fig. 3 it will be noticed that there is a lug D<sup>5</sup> adjacent to the shoulder against which C<sup>3</sup> strikes when it stops. The straight part of the pin C<sup>3</sup> passes beyond the end of the lug but the hooked part is adapted to pass between the lug and the shoulder. At the time when the governor is stopped the lever D is low enough for the hook to pass over the lug. The instant the arm G leaves the lever D the said lever rises high enough for the hook to lie between the lug D<sup>5</sup> and the shoulder. As the hook on the arm E<sup>1</sup> holds the lever D in this position during the time the levers B are moved, it is evident that such movement can not affect the governor even though the operating parts may not work freely. In other words, these parts form a lock to prevent the accidental displacement of the governor during the time that the calling device is being set for a desired selection.

Other features not included in this special enumeration have been previously referred to and will be pointed out in the claims.

What I claim is.

1. In a station calling device, a spring by which it is actuated, a series of numbered levers or keys by the movement of any one of which said spring is wound, and means by which upon moving any one of said levers the calling device will be automatically set for the selection of a station corresponding to the particular lever moved.

2. The combination with two party lines each having a series of stations thereon, of

an impulse sending device, a series of levers numbered to represent stations of the lines, means by which upon moving two levers from their normal positions the impulse sending device will be set for the automatic selection of similarly numbered stations, a key for starting the impulse sending device into operation, and means by which upon moving said key in one direction the selection will be for two stations on one line while by moving it in the opposite directions the selection will be for stations on two lines.

3. The combination with two party lines and contact points adapted to be connected separately to said lines, of a contact maker movable from the contact point of one line to the contact point of the other line, a battery, and means by which upon operating said contact maker impulses from said battery will flow alternately over the two party lines.

4. In a calling device, a contact maker operated by a movable device, a second contact maker carried by the movable device, a series of contact points in the path of the second contact maker, and a series of levers or keys each arranged to connect either of two of the contact points to a telephone line.

5. The combination with two party lines, and an impulse sending device simultaneously connected to both, of a series of levers or keys each of which is arranged to make a second connection to one of the party lines, and means by which a movement of a key in one direction will close its second connection to one line while a movement in the opposite direction will close the connection to the other party line.

6. A contact maker arranged to be moved alternately to two contact points, a device for so moving it, a second contact maker carried by said device, a series of contact points in the path of the second contact maker and so arranged that the second contact maker will connect to one of them each time that the first contact maker connects to one of its contact points, connections from adjacent contact points for the second contact maker in pairs to pairs of other contact points, and a lever for each pair of the other contact points so arranged that it can close the connection of either contact point of its pair of contact points.

7. The combination with a party line, a device for sending operating and signaling impulses over said line, means by which the operating impulses will serve to connect telephonically to the line selected ones of a plurality of stations thereon, and means by which the signaling impulses will signal any station so connected, of an adjustable device arranged to automatically divide a continuous series of impulses so the first part will act as operating impulses and the last part will act as signaling impulses.



8. The combination with a party line, having a plurality of stations thereon, and a device for sending a continuous series of impulses over said line, of an adjustable device arranged to automatically divide such series of impulses into two sections at a predetermined point, means by which the first section of said impulses will serve to select desired stations and connect them telephonically to the line, and means by which the second section of said impulses will serve to signal the stations selected by the first section.

9. The combination with a plurality of stations thereon, a device for sending a continuous series of impulses, and means for connecting two of said lines to said device so that the impulses therefrom will flow alternately over the lines, of means for automatically dividing said series of impulses into two sections, means by which the impulses of the first section will automatically select a desired station on each line, and means by which the impulses of the second section will signal the stations so selected.

10. The combination with a party line having a series of local stations thereon, a device for selecting any desired stations, and means for operating said device, of means for connecting the party line to the selecting device at the beginning of an operation, and automatically operating means for disconnecting said line at the termination of such operation.

11. The combination with a plurality of party lines each having a series of local stations thereon, of a device for automatically selecting a station having any particular number, means for connecting said device to any one of the party lines and for starting the device into operation, and means for automatically disconnecting the connected line immediately upon the completion of such operation.

12. The combination with a telephone line, a drop or other signal therefor, and a device for sending operating impulses so as to telephonically connect a station on said line to some other station on the same or another line, of means by which upon sending such impulses said drop is automatically placed in an electric circuit, means by which the telephonically connected stations are disconnected, and means by which such disconnection breaks the electric circuit through said drop.

13. The combination with a plurality of party lines, each having a plurality of stations thereon, a device for sending a continuous series of impulses, and means for connecting two of said lines to said device so that the impulses therefrom will flow alternately over the lines, of means for automatically dividing said series of impulses into two sections, means by which the im-

pulses of the first section will automatically select a desired station on each line, and means by which the impulses of the second section will signal the stations so selected.

14. The combination with a party line having a series of local stations thereon, a calling device adapted to be set for the simultaneous selection of two desired stations on the line, and means for operating said device, of a governor for regulating the speed of such operation, and means by which said governor is locked during the setting operation.

15. In a selecting device, movable contact making devices, normally open connections, a key arranged to connect said connections to said contact making devices, and interlocking mechanism for holding said key.

16. In a selecting device, movable contact making devices, a key for connecting said devices to a circuit, and interlocking mechanism for holding said key.

17. In a selecting device, movable contact making devices, a key for connecting said devices to a circuit, means for holding said connections in a closed condition during the movement of said contact making devices, and automatically operating means for releasing the connections closed by said key upon the completion of the operation of the movable contact making devices.

18. The combination with a selecting device, and means for setting it in operation, of means for connecting said device to the circuit, and automatically operating means for disconnecting said device from the circuit upon the completion of its operation.

19. The combination with a selecting device, of a key by the manipulation of which the device is connected to a circuit and set into automatic operation, of automatically operating means for breaking the connection of said device upon the completion of its operation.

20. The combination with a selecting device, and means for operating it, of a series of electrical connections, means for connecting said device to any one of said connections, and automatically operating means for disconnecting said device from the selected connection immediately upon the completion of its operation.

21. The combination with a selecting device, and a series of electrical connections, of a separate key for each connection, means by which the manipulation of any key connects the device to the connection to which the key belongs and also starts the device into operation, and means by which the device is automatically disconnected from the selected connection upon the completion of its operation.

22. The combination with an impulse sending device, a key by the manipulation of which it is started into operation, and an



electrical connection through which the impulses flow in a given direction while the device is in operation, of a circuit reversing switch connected to and operated by the impulse sending device, and means by which a second manipulation of said key will send a second impulse in a direction contrary to the prior impulses.

23. In a selecting device, means for sending a series of electrical impulses, a key for connecting said means to a party line, means for holding said key in its connecting position during the sending of said impulses, and automatically operating means for disconnecting said impulse sending means as soon as the required number of impulses have been sent.

24. In a selecting device, movable contact making devices, party line connections, a key arranged to connect said connections to said contact making devices, and interlocking mechanism for holding said key.

25. In a selecting device, movable contact making devices, party line connections, a key arranged to connect said connections to said contact making devices, means by which a movement of said key will set said contact making devices into operation, and automatic means for returning said key to its normal position when said contact making devices have completed their operation.

26. The combination with a party line and a series of local stations connected to the party line, of a selecting device, a key arranged to connect said party line to said selecting device and to set said selecting device in operation, and automatically operating means by which said key disconnects said party line when said selecting device has completed its operation.

27. The combination with a party line and a series of local stations connected to said party line, of a device for selecting any desired stations on said line, means for connecting said line to said device and for setting the device in operation, and automatically operating means for disconnecting said device from said line when said device has completed its operation.

28. The combination with a party line and a series of local stations connected to said party line, of a selecting device, means by which said device may be set for the selection of any desired stations on said line, a key for connecting said line to said selecting device and for setting said device in operation, means for locking said key in its connecting position, and means controlled by the operation of said device for releasing said key and disconnecting said line when said device has completed its selecting operation.

29. The combination with a series of party lines each of which has connected thereto a series of local stations, of a station selecting

device, a series of keys on said device, each key representing a different station on any one of said lines, a second series of keys each one of which represents a different party line, and means by which upon manual operation of said keys any station on one of said lines will be automatically connected to any station on any one of the other lines.

30. The combination with a series of party lines each of which has a series of local stations connected thereto, of a selecting device adapted to be moved from its normal position and to be automatically returned thereto, means for holding the selecting device at its moved position, a series of keys each of which is provided with a cord adapted to be connected to any party line, means by which the movement of said key will release the selecting device from its held position and make electrical connections whereby the return movement of the selecting device will send a series of electrical impulses over one of the party lines, and means by which the final movement of the selecting device will return the moved key to its normal position.

31. The combination with a series of party lines each of which is provided with a series of local stations, of a station selecting device, means by which said selecting device is connected to one of said party lines and by which it is set in operation so as to select desired stations on the party line, and automatically operating means by which said selecting device is disconnected from the party line as soon as the desired stations thereon have been selected.

32. The combination with a party line provided with a series of local stations, of a station selecting device, a key by which the selecting device is connected to the party line and by which it is set in operation so as to select desired stations, means by which the selecting device will also cause an alarm to be sounded at the selected stations, and automatically operating means for disconnecting said selecting device from said party line as soon as said alarm has been sounded.

33. The combination with a series of party lines each of which is connected to a series of local stations, of a station selecting device, means by which said selecting device may be connected to any one of the party lines, and automatically operating means by which said selecting device will select desired stations on the party line to which it is connected, will sound an alarm at the selected stations, and will disconnect itself from the party line so that it may immediately be connected to some other party line.

34. The combination with the moving parts of a selecting device, and a series of plugs and cords connected to corresponding contact springs, of a lever for each cord and its connections, and means by which upon



moving any lever to select a cord such movement of the selected lever will set the selecting device into operation to send a series of impulses over the selected cord.

5 35. The combination with a selecting device, an arm for operating the same, a battery, and a line leading to the battery, of a series of cords and plugs, a set of contact springs for each cord, a lever for each set  
10 of contact springs by the movement of which the corresponding contact springs are operated so as to connect the corresponding cord to the battery line, and means by which upon moving any lever to make such connection,  
15 such movement will set the selecting device into operation to send a series of impulses

from the battery over the corresponding cord.

36. The combination with an impulse sending device, an arm for operating the same, 20 a series of cord selecting levers, and a cord for each lever, of means by which upon operating any lever to select a cord such operation of the lever will set the impulse sending device into operation to send impulses over 25 the selected cord.

Signed at Chicago, Ill. this 31st day of August 1904.

NILS EMEL NORSTROM.

Witnesses:

WILLIAM M. ROBERTS,  
CASPER L. REDFIELD.