D. W. KNEISLY.

SELECTIVE SIGNALING APPARATUS.

APPLICATION FILED MAY 3, 1909.

1,035,971.

Patented Aug. 20, 1912.

3 SHEETS—SHEET 1.

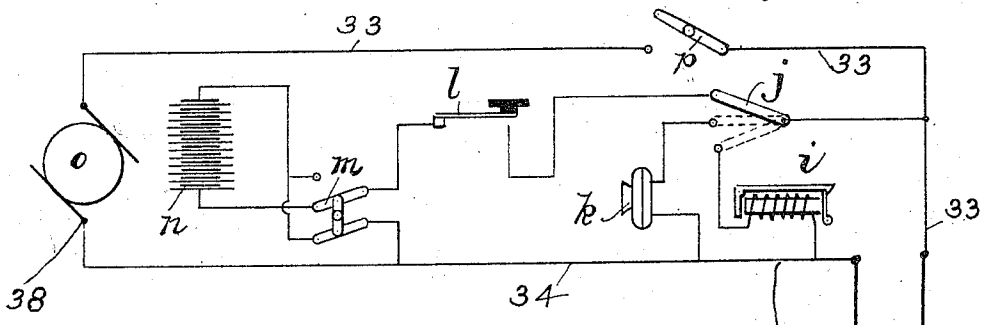

Fig. 1

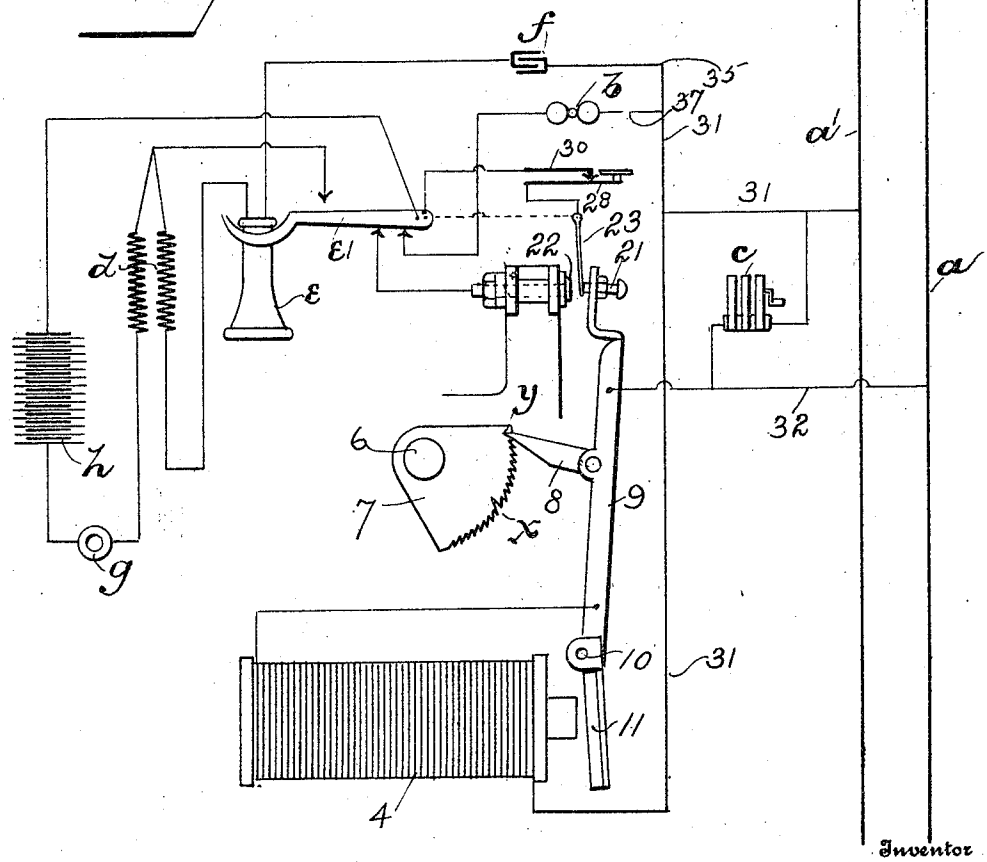

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Fig. 3.

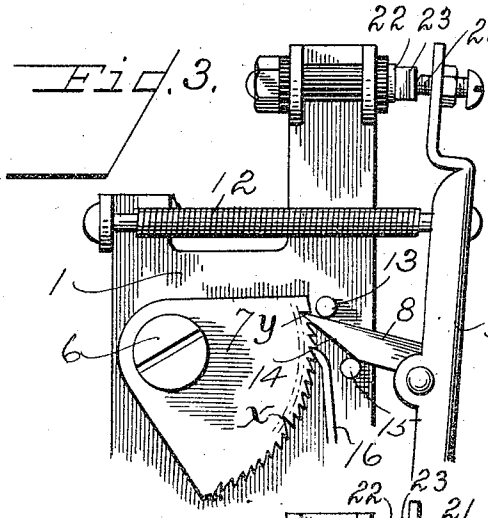

Fig. 4.

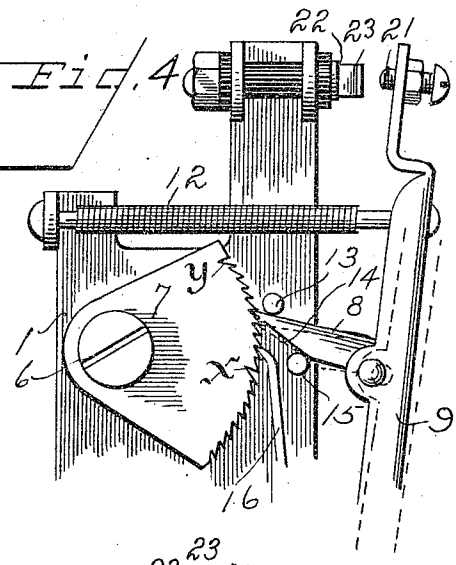

Fig. 5.

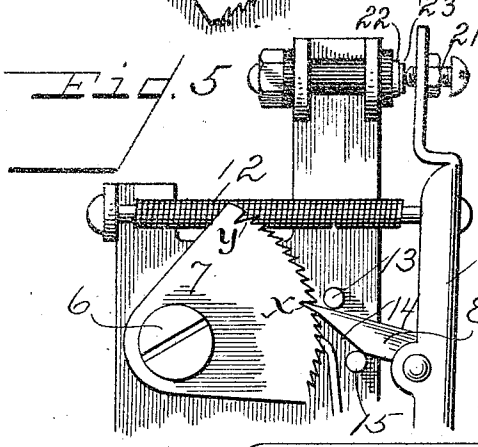

Fig. 2.

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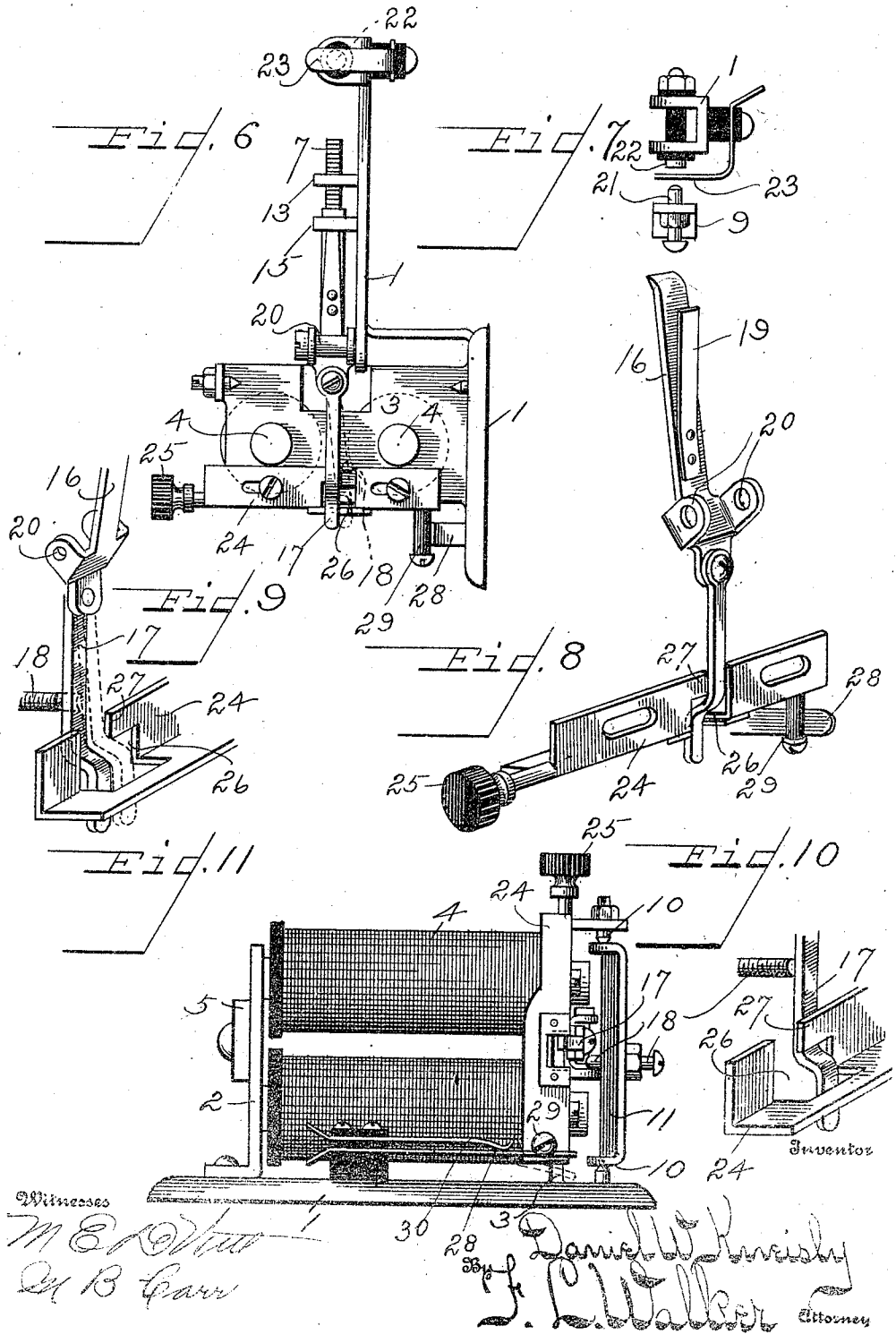

UNITED STATES PATENT OFFICE.

DANIEL W. KNEISLY, OF DAYTON, OHIO, ASSIGNOR TO THE DAYTON TELEPHONE LOCKOUT MFG. CO., OF DAYTON, OHIO, A CORPORATION OF OHIO.

SELECTIVE SIGNALING APPARATUS.

1,035,971. Specification of Letters Patent. Patented Aug. 20, 1912.

Application filed May 3, 1909. Serial No. 493,730.

To all whom it may concern:

Be it known that I, DANIEL W. KNEISLY, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Selective Signaling Apparatus, of which the following is a specification.

My invention relates to telephone apparatus and particularly to lockout devices for common or party line telephones.

The objects of the invention are to simplify the structure as well as the means and mode of operation of such devices whereby they will not only be cheapened in construction but will be rendered more positive and efficient in operation, easily operated, and unlikely to get out of repair.

One of the primary objects of the invention is to provide a device of this character in which only the instrument selected from the series of similar instruments on a common line will be rung in calling the subscriber, and particularly to provide a device whereby any subscriber other than the one called will be prevented from using his instrument until the line is returned to normal, thus preventing interruption to a conversation and preventing the conversation being overheard by other parties on the common line.

A further object is to provide means for returning the respective instruments to normal instantly at the will of the operator without the necessity of completing a series of step-up operations as is usual in such devices.

A further primary object of the present invention is to provide an instrument which may readily be introduced into the circuits of existing common party lines without the necessity of re-arranging the circuits or in any way interfering with the telephone mechanism.

A further primary object is to provide means whereby the step up mechanism may be rendered inoperative by the subscriber or maintained in its normal condition, thus enabling the central operator to "call back" on the line and select another instrument on the same line independent of the calling instrument, and further to provide means whereby the calling instrument will thereby be temporarily cut out of the talking circuit so that the subscriber can not, by blocking his instrument, be enabled to overhear conversations.

With the above primary and other incidental objects in view, as will more fully appear in the specification, the invention consists of the features of construction, parts and combinations thereof, and mode of operation, or their equivalents, as hereinafter described and set forth in the claims.

In the drawings, Figure 1 is a diagrammatic view indicating the circuits of the central operating station and one subscriber station including the telephone and the lockout mechanism. Fig. 2 is a side elevation of the assembled lockout device. Figs. 3, 4, and 5 are enlarged detail views of a portion of the lockout mechanism in different positions or stages of operation. Fig. 6 is an end view of the assembled lockout device. Fig. 7 is a top plan view of the contacts or circuit terminals. Fig. 8 is a perspective view of the detent pawl, the polarized armature and means for locking the parts. Figs. 9 and 10 are detail perspective views of the polarized armature and locking means therefor. Fig. 11 is a bottom plan view of the assembled lockout device.

Like parts are indicated by similar characters of reference throughout the several views.

The device shown in the drawings and hereinafter described is designed to be one of a series of similar instruments located on a common or party line and adapted to be operated from a central station by a series of separate impulses sent over the line, each instrument being adapted to be released or brought into talking condition by a definite predetermined number of impulses. The construction is such that only one instrument is ordinarily in the talking circuit at a time, the remaining instruments of the line being maintained in an inoperative condition. However, the present invention involves means for bringing several of the instruments on a common line in talking condition at the same time.

In constructing the device there is employed a support or main frame 1 preferably of metal but which may be of any other suitable material. Supported on brackets 2 and 3 projecting from the main frame is an electromagnet 4 bridged across the main line and excited by a current from the central station. A permanent magnet 5 is also

supported on the bracket 2 and extends adjacent to the electromagnet 4. The bracket 2 is of iron connecting the cores of the respective coils of the magnet 4. Pivoted at 6 on the frame 1 is an oscillating sector 7 having in the periphery thereof a series of notches or ratchet serrations. These ratchet serrations are engaged by an actuating pawl 8 carried on an oscillating lever 9 pivoted at 10 to the bracket 3. The lever 9 carries below its pivoted point 10 an armature 11 attracted by the electromagnet 4 to oscillate said lever against the tension of a spring 12 which tends to oscillate the lever to normal after each movement due to an electric impulse through the magnet 4. The actuating pawl 8 engages the oscillating sector 7 slightly above the pivotal point thereof or eccentric therewith, whereby the pressure on said sector by the pawl due to the pull on the spring 12 upon the lever 9, will cause a revoluble movement of the sector. The operating pawl 8 is pivoted to the lever 9 and is permitted a slight pivotal movement at each oscillation of said lever due to the elevation of the particular notch of the sector 7 with which it is engaged. The movement of the sector and pawl, however, is limited to the distance of one tooth or notch at each operation by a pin 13 in the main frame which arrests or limits the upward movement of the pawl 8. The actuation of the sector 7 is further assisted by an inclined cam surface 14 on the underside of the pawl 8, which, during the forward movement of the pawl, engages a pin 15 also in the main frame and thereby serves to elevate the pawl. Upon the oscillation of the lever 9 by the attraction of the electromagnet 4, the pawl is withdrawn from engagement with the sector 7 and when the cam surface 14 has receded beyond the pin 15 the pawl 8 drops to a position to engage the next notch of the series as shown in dotted lines in Fig. 4. When the electric current is interrupted and the magnet 4 no longer attracts the armature 11, the spring 12 will return the lever 9 to normal position, causing the pawl 8 to engage the next tooth or notch of the series and thereby oscillate the sector 7 until arrested by the pin 13 as shown in solid lines in Fig. 4. A spring actuated detent arm 16 is pivoted on the main frame and normally engages the ratchet teeth of the sector 7 to maintain the sector in its operated position. Pivoted to the lower portion of the detent arm 16 is a swinging polarized armature 17 controlled by the electromagnet 4 and permanent magnet 5 and caused thereby to swing about its pivotal connection with the detent arm 16 into and out of the path of the contact screw or stud 18 projecting from the armature 11. The construction is such that when the polarized armature 17 is out of the path of the stud 18, as shown in Figs. 6 and 11, the lever 9 is free to oscillate independent of the detent arm 16 and by this oscillation causes the movement of the sector 7 through a step by step movement, the sector being maintained in its operated position by the detent arm 16 under the influence of the spring 19. However, upon the reversal of the direction of the current through the electromagnet 4 the swinging polarized armature 17 will be caused to move into the path of the stud 18 and upon the oscillation of the lever 9 due to the attraction of the armature 11 by the electromagnet 4, the stud 18 will engage the swinging polarized armature 17 and thereby oscillate the detent 16 on its pivotal connection 20 causing the withdrawal of the detent arm 16 from engagement with the ratchet teeth of the sector 7 permitting the sector to return to normal position. At its upper extremity the lever 9 carries a contact terminal 21 directly connected with the main line. Supported on the upper portion of the main frame 1 is a ringing circuit terminal 22 and interposed between the ringing circuit terminal 22 and the movable terminal 21 on the lever 9 is a talking circuit terminal 23. The arrangement is such that by the limited movement of the lever 9 the terminal 21 is brought into contact with the talking circuit terminal 23 thereby closing the talking circuit and enabling the subscriber to talk with the central operator. By an additional oscillation of the lever 9 the talking circuit terminal 23 is deflected sufficient to contact the ringing circuit terminal through the terminal 23 interposed between the ringing circuit terminal 22 and the movable terminal 21. In the series of notches or ratchet teeth in the sector 7 there are two notches of greater depth than the others:—a deep notch x which varies in its relative location in each sector of the series of instruments on the common line according to the number of steps or impulses required to bring the instrument into operative condition; and, a second deep notch y which is the initial notch of the series and which is of less depth than the notch x but of greater depth than the remaining notches. The notch y is similarly located in each of the instruments; that is, it is the initial notch of the series. The second notch of the series in each of the instruments is a shallow notch. The notch x may occupy any of the remaining positions on the sector but is differently located in each instrument. The adjustment of the parts is such that when the actuating pawl 8 is engaged in the deep notch x the ringing circuit between the terminal 21 on the lever 9 and the terminal 22 is completed through the contact of the terminal 21 with the talking terminal 23 and the contact of the terminal 23 which is flexed by the engagement of the terminal 21 into contact with the ringing circuit terminal 22.

Thus, when the deep notch x is engaged by the actuating pawl 8 both the talking circuit and the ringing circuit are closed as more particularly shown in Fig. 5. However, the notch y, being of less depth than the notch x, will limit the oscillation of the lever 9 and the adjustment is such that when the pawl 8 is engaged in the said notch y the movable terminal 21 on the lever 9 will contact the talking circuit terminal 23, but the talking circuit terminal 23 will not, in this case, be flexed sufficient to contact the ringing circuit terminal 22 and the ringing circuit terminal will remain open. This is clearly shown in Fig. 3.

When the actuating pawl 8 is engaged in one of the shallow notches not only will the ringing circuit be broken by the talking circuit terminal being held out of contact with the terminal 22, but the talking circuit also will be broken by the movable terminal 21 being held out of contact with the talking circuit terminal 23. The engagement of the actuating pawl 8 with the notches of the sector 7 limits the oscillation of the lever 9 permitting a greater oscillation when engaging the deepest notch x thereby closing both ringing and talking circuits permitting less oscillation when engaging the medium deep notch y thereby closing only the talking circuit and permitting the less oscillation of the lever 9 when engaging the shallow notches in which case both the talking and ringing circuits are maintained open as is particularly shown in Fig. 4.

The normal positions of all the instruments on the line are with the actuating pawl 8 in the initial deep notch y which permits the lever 9 to oscillate sufficiently to cause the movable terminal 21 to contact the talking circuit terminal 23, thus closing the talking circuit and permitting any subscriber on the common line to communicate with central upon removing the receiver from the hook. It will be understood that the normal condition of all the instruments on the line is with the talking circuit closed and the ringing circuit open, the actuating pawl 8 being engaged in the medium deep notch y as shown in Fig. 3. However, the first step up operation whereby the actuating pawl 8 engages the second notch or tooth which in every case is the shallow notch opens both the talking and ringing circuits as shown in Fig. 4. Subsequent step up operations cause different instruments on the common line to be brought into operative condition by the closing of both the talking and ringing circuits upon the engagement of the actuating pawl 8 with the extreme deep notch x as shown in Fig. 5.

After the respective devices have been stepped up the desired instrument selected and conversation finished, it becomes necessary to return the devices to normal condition preparatory to the next call. When it is desired to return the parts to normal an impulse is sent over the line in a reverse direction from the central station, thus reversing the poles of electromagnet and causing the polarized armature 17 to move on its pivotal connection to the position indicated in dotted lines in Fig. 6, in which position it will be in the path of the stud 18 carried in the armature 11 and through the attraction of the armature 11 by the magnet 4 the stud 18 will engage the polarized armature 17 and oscillate the detent lever 16 upon its pivotal connections 20, to withdraw the detent lever from engagement with the ratchet teeth of the sector 7, whereby permitting the sector to return to the normal position when the actuating pawl 8 will again rest in the initial or medium deep notch y as before described. The movement of the polarized armature 17 due to the engagement of the stud 18, is indicated by dotted lines in Fig. 9.

It will thus be seen that the step up or selecting operation and the release or return to normal position are both accomplished by the oscillation of the lever 9 due to the attraction of the single armature 11 by the magnet 4. Whether the oscillation of the lever 9 accomplishes the step up or the release of the sector is determined by the position of the pivoted polarized armature 17 which is moved into or out of the path of the stud 18 according to the direction in which the electric impulse is sent through the magnet 4. The oscillation of the lever 9, independent of the polarized armature 17 when said polarized armature is out of the path of the stud 18, will, upon the return of the lever 9 to normal, cause the sector to be stepped up the distance of one notch. However, when the polarized armature 17 is moved into the path of the stud 18, the lever 9 and the detent lever 16 also move in unison due to the attraction of the armature 11 by the magnet 4 which will not only withdraw the actuating pawl 8 but also the detent lever 16 from engagement with the sector thereby permitting the sector to return to normal. In case a subscriber wishes to talk with a second subscriber on the same line, provision is made whereby the calling subscriber may lock his instrument against the step up operation thereby maintaining the actuating pawl 8 in the initial or medium deep notch y and the talking circuit closed as in Fig. 3. This is accomplished by means of a slide member 24 mounted to reciprocate on the bracket 3 on the main frame and operated by the subscriber by the depression of a button 25 protruding from the case of the instrument. The slide member 24 is provided with a recess or notch 26 within which the extremity of the polarized armature 17 extends. By the depression of the

button 25 the slide member 24 is reciprocated and the polarized armature may be moved about its pivotal connection on the detent lever 16 into the path of the stud 18 against the influence of the electromagnet 4. The slide member 24 is provided with a finger portion 27 which projects beyond the polarized armature 17 and when the polarized armature has been moved into the path of the stud 18 by the reciprocatory movement of the slide 24 the finger portion 27 will block the movement of the polarized armature 17 due to the engagement therewith of the stud 18 and thereby prevent the oscillation of the detent lever 16 and its disengagement from the sector 7. This is particularly shown in Fig. 10.

It is to be remembered that the polarized armature 17 has two swinging or oscillatory movements; that is, a lateral movement about its pivotal connection upon the lower end of the detent lever 16 and the second movement at right angles thereto in unison with the detent lever 16 about the pivotal connection 20 thereof. The slide member 24 is normally held in its normal position by a spring plate 28 engaging a stud 29 on said slide. When the slide member 24 is in its normal position and the polarized armature 17 is moved into the path of the stud 18 through the influence of the electromagnet 4 through which the impulse is sent in reverse direction, the polarized armature 17 will move beyond the extremity of the finger portion 27 of the slide member 24 as shown in Fig. 9 in which case it will be permitted to move inward upon being engaged by the stud 18 thereby operating the detent lever 16 to withdraw it from the sector 7.

As before described, an unscrupulous person might, by depressing the button 25 of his instrument lock his instrument against operation and enable him to overhear conversations. In order to obviate this, the spring plate 28 which returns the slide member 24 to normal is preferably one blade of a switch 30 in the talking circuit as shown in Fig. 1 the corresponding blade of which is in contact with the plate 28 and the circuit closed when the parts are in normal position. However, when the subscriber depresses the button 25 to lock his instrument against operation he simultaneously opens the talking circuit through the flexing of the spring plate 28, thus rendering the instrument inoperative until the button 25 is released.

Circuits.—In Fig. 1 is illustrated diagrammatically the various circuits, operative parts and connections; the central station apparatus being indicated at the top and the subscriber's instrument at the bottom of the figure. At the right of the figure is the main line a—a^1 common to a number of subscribers' instruments. The magnet 4 is bridged across the line; the drop line 31 connecting one terminal of the magnet 4 with one side of the main line, the opposite terminal of the magnet being attached to the main frame, which, in turn is connected to the opposite side of the main line by a drop line 32, thus completing the circuit between the opposite sides of the main line a—a^1 through the magnet 4 and frame. The subscriber's call bell b is bridged between the terminal 22 on the main frame 1 and the drop line 31 including in the circuit a switch, closed by the receiver hook when said hook is down. The ringing circuit is as follows: from the main line a through the drop line 32 to the frame 1; thence from the contact 21 to the contact 22 through the intermediate terminal 23; thence through the switch closed by the receiver hook e^1 and bells b to the drop line 31 and the side a^1 of the main line. The subscriber's calling magneto c is bridged between the drop lines 31 and 32. The receiver and transmitter circuits are the usual telephone connections. The receiver hook e^1 of the telephone instrument is connected through the switch comprising the plates 28 and 30 with the talking circuit terminal 23, which in turn is in contact with the terminal 21 on the main frame of the lockout instrument and through the drop line 32 with the main line a. The receiver hook is adapted, when in its down position, or when carrying the receiver, to close the ringing circuit and when the receiver is removed and the hook moves to its upper position, to break the ringing circuit and close the receiver and transmitter circuits as is usual in telephone constructions. The receiver circuit extends between the receiver hook e^1 through the secondary of the coil d to the drop line 31 including in said circuit the receiver e and condenser f. The transmitter circuit extends from the receiver hook e^1 through the primary of the coil d and thence back to the receiver hook, including in the circuit, the transmitter g and the battery h. At the central station there are two lines 33 and 34 connected with the main line a and a^1 through the usual calling and answering jacks not shown in the drawings. The usual annunciator drop is indicated at i and is normally bridged across the lines 33 and 34 through a switch j. k is the operator's instrument, l is a key for sending separate selecting impulses over the line to operate the subscriber's selector mechanism. A pole changer m is provided to reverse the direction of the current from the battery or other source of energy n. o is a generator adapted to be brought into the circuit by the closing of the switch p.

Operation.—When in normal position as indicated in Figs. 2 and 3, the actuating pawl 8 engages the notch y and the talking circuit between the terminals 21 and 23, is

closed. The subscriber operates the calling magneto c and removes his receiver from the hook, allowing the hook to be lifted by suitable spring action, thereby closing the receiver and transmitter circuits and simultaneously breaking the ringing circuit. This call is indicated to the central operator by the annunciator drop i. The operator moves the switch j to cut the drop i out of circuit and to bring the operator's instrument k into the talking circuit. Upon receiving the subscriber's call the operator will move the switch j to cut out the operator's instrument k to bring into the circuit the impulse sending key l. The operator will select or unlock the desired instrument by operating the key l to close the circuit a predetermined number of times as may be necessary to bring the actuating pawl 8 of the desired instrument into the deep notch x. At each closure of the key l an electric impulse will pass from the battery m through the key l and switch j to the line 33, thence to the main line a and over the drop lines 32 and through the magnet 4 of every instrument on the line, thence returning over the drop lines 31, main line a^1 and central station line 23, to the battery, thus completing the circuit. Each impulse exciting the magnet 4 will cause the oscillatory sector 7 to be stepped up one notch as before described. At the first step or impulse the actuating pawl 8 of each instrument on the line will engage the second notch, which in every instrument is a shallow one. This will hold the lever 9 in such relation that the terminal 21 will be disengaged from the terminal 23 and the talking circuit will be maintained open. At each subsequent step of the respective instruments the actuating pawl 8 of some one of the series of instruments will engage the deep notch x said notch x being differently located in each instrument. The instrument illustrated in the drawings is the number nine instrument of the series being brought into operation on the tenth step or impulse. The first step serves to break the talking connections between the contacts 21 and 23 while the ninth subsequent step will release the illustrated instrument by the actuating pawl 8 engaging the deep notch x which will permit the lever 9 to oscillate sufficiently to close both the talking and ringing circuits. The subscriber is then called by closing the switch p, thus sending the current through the generator o over the line 33 and main line a to the drop line 32; thence through the frame 1 to the lever 9 the terminals 21, 23, and 22, through the bell b to the drop line 31 and to the return, main line a^1 and central station line 34 to the opposite pole of the generator o. At the time the actuating pawl 8 of the illustrated or called instrument engages the notch x the pawl 8 of every other instrument on the line is engaged with a shallow notch and the ringing and talking circuits of such instrument are broken. If the subscriber desires to talk with a second party on the same common line after calling the central operator as before described, he will depress the button 25 of his instrument which will operate the slide member 24 to move the swinging polarized armature 17 into the path of the stud 18 at which time the finger portion 27 of the slide member 24 will be thrust behind the polarized armature 17 and will thereby prevent the oscillation of the detent arm 16 when contacted by the stud 18 and by thus blocking the movement of the armature 11 when attracted by the magnet 4, the oscillation of the lever 9 is effectually prevented and the sector 7 remains in its normal position with the actuating pawl 8 engaging the initial notch y and the talking circuit closed as in Fig. 3. While the calling subscriber's instrument is thus held inoperative the remaining instruments on the line are stepped up in the manner before described to select the desired instrument which will bring the two instruments, the calling instrument and the selected instrument into the talking circuit at the same time. When it is desired to return the instruments to normal after the completion of the conversation, the key l is closed to send an impulse in the opposite direction over the line through the magnet 4 of the respective instruments. The changed polarity of the magnet 4 will cause the return of the polarized armature 17, moving said armature into the path of the stud 18 thereby causing the detent arm 16 to be oscillated by the oscillation of the armature 11 to disengage it from the sector 7 and at the same time withdrawing the actuating pawl 8. When so disengaged, the sector will be returned to normal by gravity. While a double metallic circuit a—a^1 has been described, the main line wire a^1 might be dispensed with under certain conditions, and the lines 31 and 34 might be grounded at 35 and 36 in Fig. 1, thus completing the circuits through the ground instead of through the line a^1. If metallic talking and selecting circuits are desired, the ringing may be accomplished through the ground between points 37 and 38 in Fig. 1.

It will thus be seen that only two conductors are required to form both the operating and talking circuits one of which conductors may be ground, or two metallic conductors may be employed with an additional grounded ringing circuit. However, the preferred form is two metallic conductors as shown in solid lines in the drawing. It will be noted that no adjustment of resistance according to the position of the instrument on the line or the strength of the current is necessary. And further that while

the device is actuated by the electrical impulse, the operations are performed independent of the strength of the current, the instrument being unaffected by any variations thereof, providing it is always of sufficient strength to excite the magnet 4 to attract the respective armatures. It is to be understood that while this construction is illustrated and described as a controlling device for party line telephones it is not limited to the field of telephony, but is equally applicable to other purposes, wherein it is desired to select some particular signal apparatus or electrical device of a series connected in a common circuit, the instrument is especially adapted for use in railway signaling work and similar purposes wherein it would only be necessary to substitute the electrical control signal apparatus for the subscriber's telephone instrument in the construction shown in the drawings. I, therefore, do not limit the invention to telephones. Furthermore, it will be impossible for a subscriber to monopolize the line or for an unscrupulous subscriber to persist in eavesdropping by holding the operating button 25 in depression and thereby maintaining the instrument in normal condition as before described. When a subscriber refuses to vacate the line upon request but continues to hold the push button of his instrument depressed the operator may nevertheless step the instrument up and thereby break the talking circuit by sending one impulse over the line in reverse direction and proceed with the usual step up operation. This impulse in reverse direction will not affect any of the instruments on the line except the one which is being held by the subscriber in as much as this reverse impulse is the operation which returns all instruments to normal under ordinary circumstances and at the beginning all the calling operation of the instruments on the line are in the normal condition. However, the reverse impulse will affect the instrument being held to step the sector 7 up one step whereby the actuating pawl 8 will engage the second or shallow notch of the series and thereby break the talking circuit. When the sliding member 24 is being held in operated position by the depression of the button 25 the polarized armature 17 is moved by the sliding member 24 against the influence of the magnet 4 into the path of the stud 18 as shown more particularly in detail in Fig. 10. However, upon the reversal of the electrical impulse through the magnet the polarized armature will be swung independent of the sliding member 24 to a position beyond the stud 18 thereby permitting the armature 11 to be attracted by the magnet and the operating lever 9 and connecting pawl 8 to be oscillated in the usual manner to step up the sector 7 one or more notches. After this has been accomplished the remaining instruments on the line may be stepped up by impulses sent in the normal direction which impulses will return the polarized armature of the unruly subscriber's instrument into the path of the stud 18 and thereby prevent the operation of his instrument to further step up the instrument if he continues to hold the slide member 24 in operated position.

From the above description it will be apparent that there is thus produced a device of the character described possessing the particular features of advantage before enumerated as desirable but which obviously is susceptible of modification in its form, detail construction, proportion, and arrangement of parts, without departing from the principle involved or sacrificing any of its advantages.

Having thus described my invention, I claim:

1. In a device as described, the combination with two electric circuits of a stationary terminal peculiar to one of said circuits, a movable terminal common to both these circuits, and a yielding terminal peculiar to the other circuit interposed between said movable and stationary terminals and means for electrically controlling said movable terminal whereby one or both of said circuits may be closed by the movement thereof, substantially as specified.

2. In a device as described, the combination with a plurality of electric circuits, of a stationary terminal in one of the circuits, a movable terminal common to all the circuits, and a yielding terminal in a second of said circuits interposed between said stationary and movable terminals, means for automatically actuating said movable terminal from a distant station, means for limiting the movement thereof whereby said movable terminal may be permitted to engage the yielding terminal and thereby close one of said circuits, or by additional movement, cause the engagement of said yielding and stationary terminals and thereby close an additional circuit, substantially as specified.

3. In a device as described, the combination with a plurality of electric circuits, of a stationary terminal, a movable terminal carried on an oscillating lever, an electromagnet adapted to oscillate said lever, a movable stop member adapted to arrest the oscillation of the lever in predetermined positions, means for varying said stop member whereby the lever will be permitted different degrees of movement, a yielding terminal interposed between the movable and stationary terminals and adapted to be engaged by the movable terminal and upon further movement thereof to engage the stationary terminal substantially as specified.

4. In a device as described, the combination with a plurality of electric circuits, of a stationary terminal, a movable terminal and a yielding terminal interposed between the stationary and movable terminals with which the movable terminal is normally in contact, a controlling device for said movable terminal adapted upon its initial movement to break the contact of the movable and yielding terminals and upon a predetermined additional movement to permit the simultaneous interengagement of all three of said terminals, substantially as specified.

5. In a device as described, a plurality of electric circuits, circuit make and break mechanism, control mechanism therefor operated from a distant station, means operated by the subscriber for arresting the operation of the control mechanism and maintaining the instrument in normal condition while permitting other instruments on the common line to be controlled thereby, and means operated from a distant station for rendering the subscriber's arresting device ineffective, substantially as specified.

6. In a device as described, circuit make and break devices, control mechanism therefor comprising step-up mechanism operated by a series of separate electric impulses and including an oscillating lever, means for arresting the oscillation of the lever at the will of the subscriber and thereby rendering the step-up mechanism in-operative, and means controlled from a distant point for releasing the lever from the control of the subscriber, substantially as specified.

7. In a device as described, circuit make and break devices, control mechanism therefor comprising step-up mechanism operated by a series of separate electric impulses including an oscillating lever, a movable stop member normally out of the path of the lever but capable of being moved into said path by the subscriber, thereby rendering the step-up mechanism in-operative and maintaining the instrument in normal condition, substantially as specified.

8. In a device as described, circuit make and break devices, control devices therefor including an oscillatory notched sector, a pawl successively engaging the notches thereof to oscillate said sector, an electromagnet and an armature coöperating therewith to actuate said pawl, a pivoted detent lever engaging the sector and maintaining it in its operated position, a polarized armature pivotally carried on said detent lever and adapted to swing into and out of the path of the actuating armature, and when in said path adapted to be engaged by the armature whereby the detent lever will be oscillated from its engagement with the sector, substantially as specified.

9. In a device as described, circuit make and break devices, control devices therefor including a movable member having a series of ratchet teeth therein, a pawl engaging said ratchet teeth to advance said member through a predetermined path, an electromagnet and an armature coöperating therewith to actuate said pawl, a detent lever engaging the movable member and maintaining it in its operated position, a polarized armature movable into and out of the path of the actuating armature and adapted when actuated thereby to cause the withdrawal of the detent lever from said movable member, substantially as specified.

10. In a device as described, circuit make and break devices, control devices therefor including a movable member having a series of ratchet teeth therein, a pawl engaging said ratchet teeth to advance said member through a predetermined path, an electromagnet and an armature coöperating therewith to actuate said pawl, a polarized armature movable into and out of the path of the actuating armature according to the direction of current through said electromagnet, means for manually moving said polarized armature into the path of the actuating armature against the influence of said magnet, substantially as specified.

11. In a device as described, circuit make and break devices, control devices therefor including a movable member having a series of ratchet teeth therein, a pawl engaging said ratchet teeth to advance said member through a predetermined path, an electromagnet and an armature coöperating therewith to actuate said pawl, a polarized armature movable into and out of the path of the actuating armature according to the direction of current through said electromagnet, means for manually moving said polarized armature into the path of the actuating armature against the influence of said magnet, and for maintaining the polarized armature immovable in its adjusted position, thereby preventing the oscillation of the actuating armature and rendering the actuating pawl in-operative, substantially as specified.

12. In a device as described, circuit make and break devices, control devices therefor including a movable member having a series of ratchet teeth therein, a pawl engaging said ratchet teeth to advance said member through a predetermined path, an electromagnet and an armature coöperating therewith to actuate said pawl, a polarized armature movable into and out of the path of the actuating armature according to the direction of current through said electromagnet, a manually operated reciprocating member adapted to engage the polarized armature and move it into the path of the actuating armature against the influence of the electromagnet, a portion on said reciprocating member projecting into

the path of the polarized armature and preventing the oscillation thereof when engaged by the actuating armature, substantially as specified.

13. In a device as described, circuit make and break devices, control devices therefor including a movable member having a series of ratchet teeth therein, a pawl engaging said ratchet teeth to advance said member through a predetermined path, an electromagnet and an armature coöperating therewith to actuate said pawl, a doubly pivoted polarized armature capable of an oscillatory movement into and out of the path of the actuating armature, and when in the path of said armature capable of oscillatory movement in unison therewith, substantially as specified.

14. In a device as described, circuit make and break devices, control devices therefor including a movable member having a series of ratchet teeth therein, a pawl engaging said ratchet teeth to advance said member through a predetermined path, an electromagnet and an armature coöperating therewith to actuate said pawl, a polarized armature movable into and out of the path of the actuating armature and further capable of movement in a plane at substantial right angles to the first movement, and when so moved adapted to cause the release of the control mechanism and permit the return thereof to normal, substantially as specified.

15. In a device as described, circuit make and break devices, control devices therefor including a movable member having a series of ratchet teeth therein, a pawl engaging said ratchet teeth to advance said member through a predetermined path, an electromagnet and an armature coöperating therewith to actuate said pawl, a polarized armature movable into and out of the path of the actuating armature and further capable of movement in a plane at substantially right angles to the first movement, and manually operated means to prevent the second movement thereof, substantially as and for the purpose specified.

16. In a device as described, circuit make and break devices, control devices therefor including a movable member having a series of ratchet teeth therein, a pawl engaging said ratchet teeth to advance said member through a predetermined path, an electromagnet and an armature coöperating therewith to, actuate said pawl, manually operated means for arresting and maintaining said pawl in inoperative condition against the influence of the electromagnet, substantially as specified.

17. In a device as described, the combination with a plurality of electric circuits, of a controlling device therefor comprising a movable stop member having an irregular engaging surface, a pivoted lever, a movable terminal carried by said lever, means on said lever engaging said movable stop whereby said lever will be varied in its relation to stationary parts of the device whereby said movable terminal will be caused to close one or more of said circuits according to the point of said stop member engaged by the lever, and means to vary the said stop member, substantially as specified.

18. In a device as described, the combination with a plurality of electric circuits, of a controlling device therefor, comprising an oscillating sector having points thereon at different distances from the axis, a pivoted lever, a movable terminal carried by said lever, means on said lever engaging said sector, whereby said lever will be varied in its relation to stationary parts of the device as the engagement of said lever with said sector is at a point of greater or less distance from the axis whereby said movable terminal will be caused to close one or more of said electric circuits or whereby said circuits will be maintained open according to the point of said sector engaged by the lever, substantially as specified.

19. In a device as described, a plurality of electric circuits, a pivoted lever, a movable terminal carried by said lever, means for oscillating said lever, a variable stop for the lever comprising an oscillating sector, means for varying said stop whereby said lever may be oscillated to a greater or less degree thereby maintaining said electric circuits open or closing one or more of said circuits according to the degree of oscillation permitted the lever by said variable stop, substantially as specified.

20. In a device as described, a plurality of electric circuits, a pivoted lever, a movable terminal carried by said lever, means for oscillating said lever, a variable stop to limit the oscillations of the lever in one direction comprising a pivoted sector having portions thereon engaged by said lever at different distances from the pivotal point thereby permitting said lever to oscillate throughout a greater or less degree and means to bring the different portions of said sector to the engaging point whereby said movable terminal carried by the lever will close one or more of circuits or maintain said circuits in open condition according to the portion of the stop engaged, substantially as specified.

21. In a device as described, a plurality of electric circuits, means to make and break said circuits including a pivoted lever, a movable terminal carried by said lever, an oscillating sector adapted to limit the movement of said lever, engaging points on said sector at different distances from the axis

thereof, whereby said lever may be limited to varying degrees of oscillation, said lever being adapted by its oscillation to close one or more of the circuits or maintain said circuits open according to the degree of such oscillation, and means to oscillate both said sector and pivoted lever, substantially as specified.

22. In a device as described, circuit make and break devices, a pivoted lever controlling said devices, an electromagnet and an armature adapted to oscillate said pivoted lever through the attraction of said armature by the magnet, and a polarized armature adapted to limit the oscillation of said lever, said polarized armature being movable into and out of operative position according to the direction of current through said magnet.

23. In a device as described, circuit make and break devices, a pivoted lever controlling said devices, an electromagnet and an armature adapted to oscillate said pivoted lever through the attraction of said armature by the magnet, and a polarized armature adapted to limit the oscillation of said lever, said polarized armature being movable into and out of operative position according to the direction of current through said magnet, and means to manually move said polarized armature into operative position against the influence of the magnet.

24. In a device as described, circuit make and break devices, a pivoted lever controlling said devices, an electromagnet and an armature adapted to oscillate said pivoted lever through the attraction of said armature by the magnet, and a stop member manually movable into the path of the lever to prevent the oscillation thereof under the influence of the magnet, substantially as specified.

25. In a device as described, circuit make and break devices, a pivoted lever controlling said devices, an electromagnet and an armature adapted to oscillate said pivoted lever through the attraction of said armature by the magnet, manually operated means to prevent the oscillation of the pivoted lever against the influence of the magnet, and means whereby the said manually operated means will be rendered ineffective and the pivoted lever released by a reversal of the current through the magnet.

26. In a device as described, circuit make and break devices, a pivoted lever controlling said devices, an electromagnet and an armature adapted to oscillate said pivoted lever through the attraction of said armature by the magnet, a stop member movable into engagement with said lever and adapted to be moved therefrom by the influence of said magnet.

27. In a device as described, an electric circuit, circuit make and break devices, controlling means therefor, an electromagnet and an armature actuating said control devices, manually operated means for maintaining the control devices inoperative against the influence of the magnet, and electrically operated means for rendering said manually operated means ineffective and returning the control devices to operation.

28. In a device as described, an electric circuit, circuit make and break devices, controlling means therefor, an electromagnet and an armature actuating said control devices, manually operated means for maintaining the control devices inoperative against the influence of the magnet, and means whereby said manually operated means will be rendered ineffective and the control devices released by a reversal of the direction of the current through said magnet.

29. In a device as described, circuit make and break devices, a pivoted lever controlling said devices, an electromagnet and an armature adapted to oscillate said pivoted lever through the attraction of said armature by the magnet, a stop member movable into engagement with said lever and adapted to be moved therefrom by the influence of said magnet, and an electric switch in said circuit opened by the operation of said manually operated means.

30. In a signaling apparatus, circuit make and break devices, a variable stop member, a movable member the movement of which is limited by said stop member, said movable member being adapted by its movement to actuate the stop member through a predetermined path of travel until the stop member reaches a predetermined position when the movable member will be permitted a greater degree of movement whereby it will operate the circuit make and break devices.

31. In a signaling apparatus, circuit make and break devices, a movable operating member for the make and break devices, a variable stop limiting the movement of the operating member to an inoperative path of travel, means for actuating the variable stop in unison with the movement of the operating member, and means for permitting the operating member an additional degree of movement when the stop member has been moved to a predetermined position whereby such additional degree of movement will operate the make and break devices.

32. In a signaling apparatus, a talking circuit, make and break devices in said circuit, control mechanism for said make and break devices operated from a distant station, a manually operated stop adapted to positively lock the make and break devices against movement thereby neutralizing the

distant operation of the control mechanism and preventing the operation of the make and break devices of the neutralized instrument while the make and break devices of the talking circuits of other instruments on the common line are controlled by the distant operation.

In testimony whereof, I have hereunto set my hand this 12th day of April A. D. 1909.

DANIEL W. KNEISLY.

Witnesses:
HARRY F. NOLAN,
MABEL B. CARR.