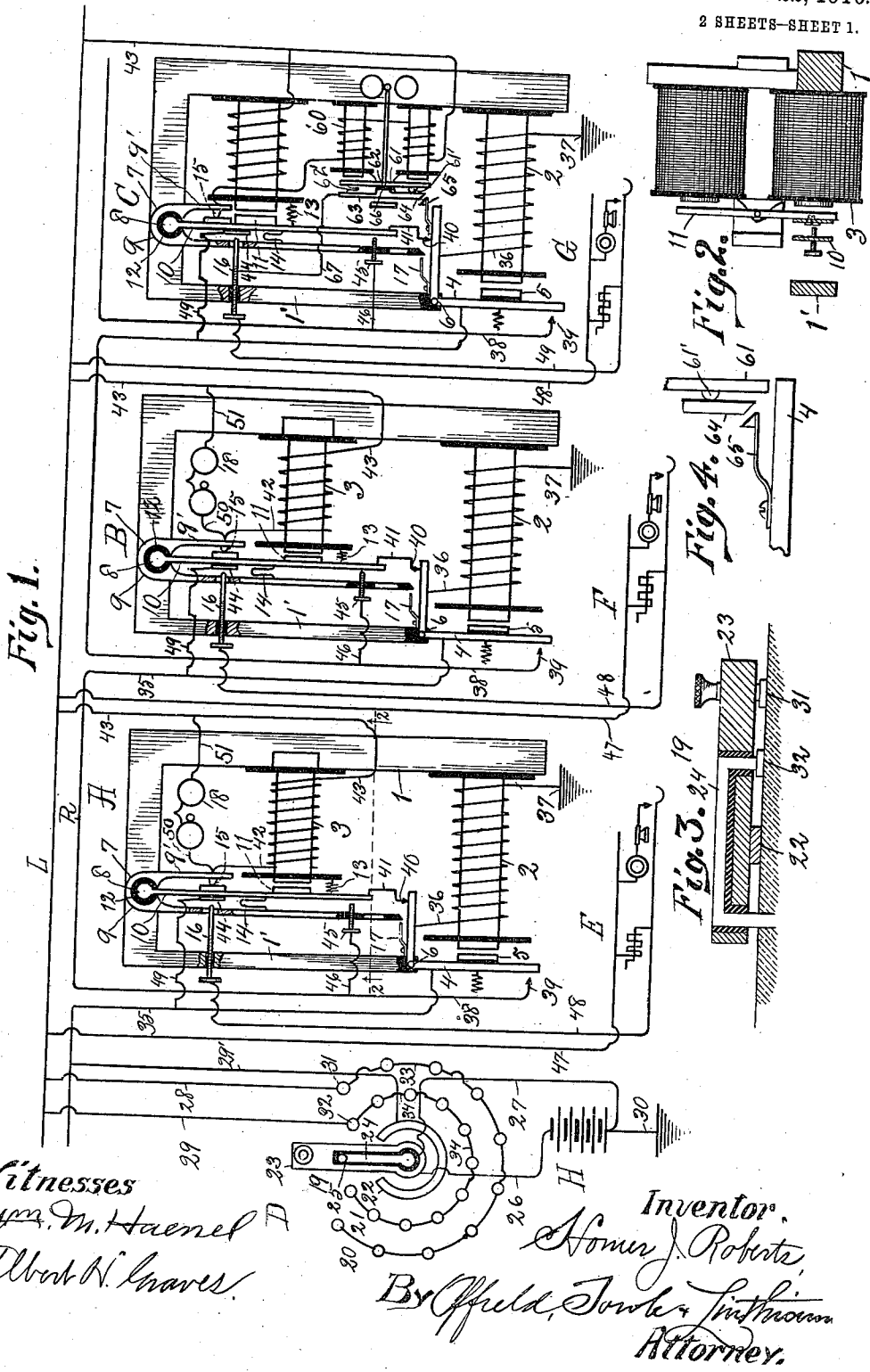




Witnesses
 Wm. M. Haenel
 Albert N. Inver.

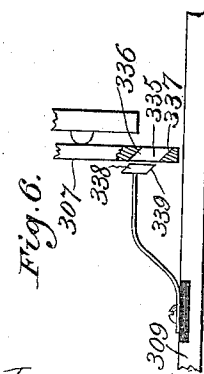
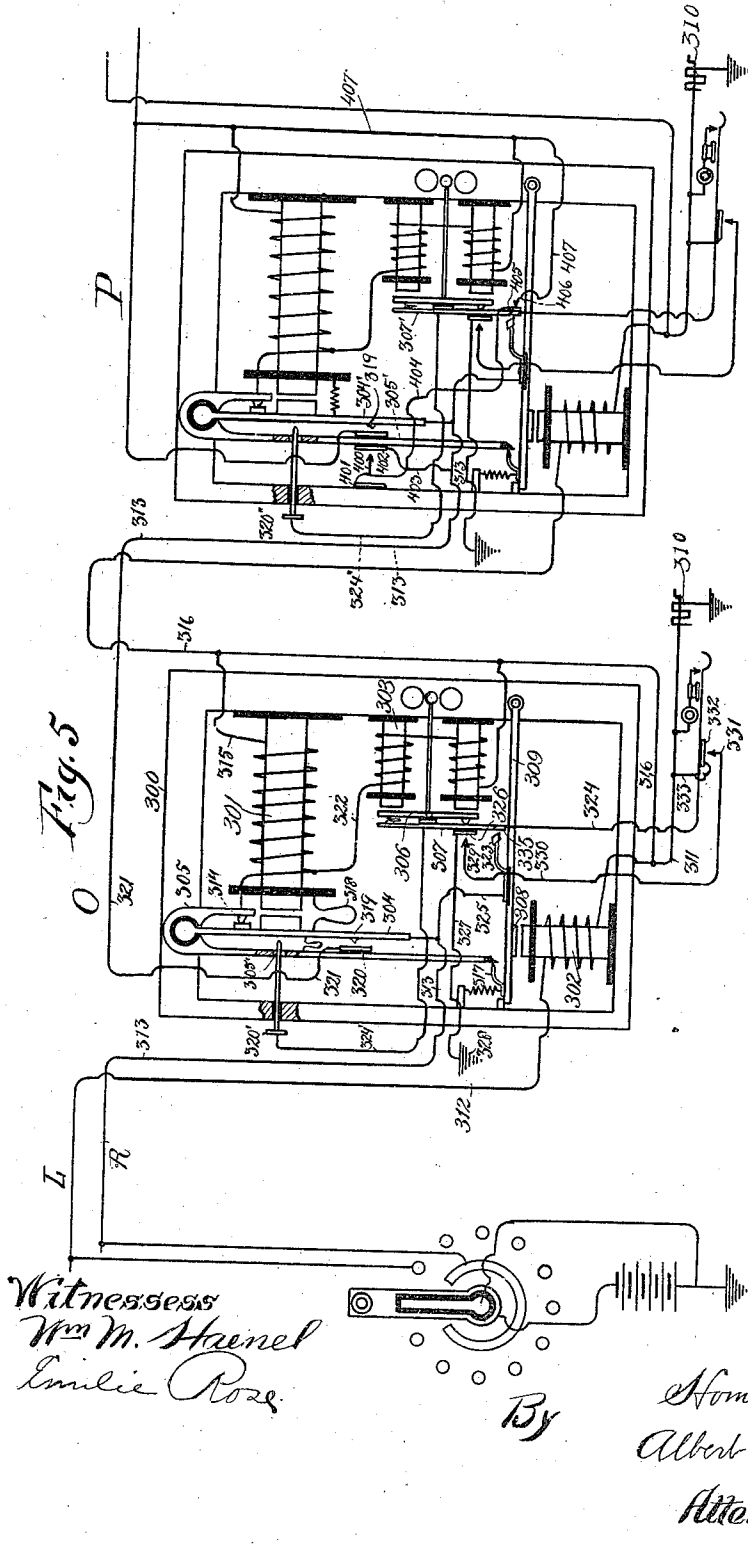
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H. J. ROBERTS.
SELECTIVE PARTY LINE TELEPHONE SYSTEM.
APPLICATION FILED SEPT. 18, 1902.

976,298.

Patented Nov. 22, 1910.

2 SHEETS-SHEET 2.



UNITED STATES PATENT OFFICE.

HOMER J. ROBERTS, OF EVANSTON, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS,
TO HOMER ROBERTS TELEPHONE CO., A CORPORATION OF WEST VIRGINIA.

SELECTIVE PARTY-LINE TELEPHONE SYSTEM.

976,298.

Specification of Letters Patent.

Patented Nov. 22, 1910.

Application filed September 18, 1902. Serial No. 123,958.

To all whom it may concern:

Be it known that I, HOMER J. ROBERTS, residing at Evanston, Cook county, Illinois, have invented certain new and useful Improvements in Selective Party-Line Telephone Systems, of which the following is a specification.

This invention relates to improvements in telephone apparatus, and refers more specifically to improvements in selective party line telephone systems.

Among the salient objects of the present invention are to provide a system in which the operator at central may select and call any one or more of the subscribers belonging to a given party line at will and without signaling or otherwise giving notice to the remaining parties belonging to said line; to provide a system in which the operator at central may give to any one or two parties upon a given party line the exclusive use of the lines so as to prevent interference by other parties; to provide means in a system of the character last mentioned whereby the parties excluded are also cut out of the talking circuit so that surreptitious listening is prevented; to provide a system in which grounding connections and connections across the line are cut off or opened in the act of selecting the parties so that the main lines are electrically intact from central to the subscriber called, thus enabling a large number of subscribers to be placed upon the same party line without seriously impairing the effectiveness of the working currents; to provide in a system of the character referred to, means whereby two subscribers belonging to the same party line may be properly connected to communicate with each other by the operator at central and at the same time the remaining parties locked out or excluded; to provide means for effectively clearing or restoring the instruments to normal condition after use and independently of, or without the coöperation of the subscriber; to provide means whereby the operator at central may have such control over the several subscribers' instruments that a subscriber may be cut off at will and during the use by him of his instrument thus enabling the operator at central to prevent arbitrary or unreasonable retention of circuit connections by subscribers, and in general, to provide improvements in the construction and arrangement of instrumen-

talities in a system of the character referred to.

To the above ends the invention consists in the matters hereinafter described and more particularly pointed out in the appended claims, and will be readily understood from the following description, reference being had to the accompanying drawings, in which—

Figure 1 is a diagrammatic view of an embodiment of the system in which current is employed to continually hold the instruments in locked-out or non-interfering position; Fig. 2 is a sectional detail view taken on line 2—2 of Fig. 1 and looking in the direction of the arrows; Fig. 3 is a longitudinal sectional view of the switch key; Fig. 4 is a fragmentary detail of the latch mechanism forming a part of the instrument shown at C, Fig. 1; Fig. 5 is a diagrammatic view of an embodiment of the system in which the operation of cutting out several instruments results in cutting off grounding connections and connections across the main lines; Fig. 6 is a detail view of a peculiar form of mechanical detent employed in connection with the system as shown in Fig. 5.

The invention is capable of embodiment in various forms, the particular embodiment illustrated being one in which current is employed to continually hold in "locked out" or non-interfering position those instruments which are passed in working down the line to the selected instrument and including the latter.

Referring first to the diagrammatic view Fig. 1, A, B and C designate as a whole three subscribers' instruments arranged in series upon a party line, D designates as a whole the central station, and E, F and G respectively the several subscribers' telephone sets pertaining to their respective selective instruments A, B and C.

Describing first the construction of one of the selective instruments as A, 1 designates as a whole a frame member which serves as a suitable support upon which to mount the several instrumentalities, as the several magnets and movable parts of the instrument. 2 designates a magnet which for convenience of description will be designated the primary magnet, and 3 designates a second magnet which is normally actuated subsequently to the movement of the first magnet and will

therefore be designated the secondary magnet. Said secondary magnet is of the polarized type, it being understood that in the diagram one coil only of the magnet is shown, and the armature is seen in end view. Upon an extension 1' of the frame member is mounted an L-shaped armature lever 4, carrying an armature proper 5 arranged in proper relation to the coil of the magnet 2; said armature lever being pivoted at its angle as indicated at 6, and insulated from its support.

7 designates as a whole a two-part armature lever suitably pivoted upon the upper part of the main frame, as indicated at 8, and arranged to depend adjacent to the coils of the magnet 3; said armature comprising a U-like outer member or contact lever 9, and an interposed armature lever proper 10, which carries the armature 11. The members 9 and 10 are insulated from each other, as indicated at 12. Both members 9 and 10 are free to oscillate upon the pivot support, except as controlled by the springs and contact devices now to be described. Between the free end of the lever 10 and the upper end of the magnet spool is interposed an expansion spring 13, which tends to hold the armature lever remote from the magnet, and between the member 10 and the longer arm of the member 9 is interposed a second expansion spring 14, which tends to force these members apart and therefore to draw the shorter arm 9' of the member 9 into bearing with the opposite side of the armature lever 10. A contact device 15 forms a fixed stop between these latter parts. An adjustable screw 16 forms a fixed back stop which arrests the movement of the armature lever under the action of the spring 13; said contact screw being insulated from the main frame and being arranged to pass through an opening in the longer arm of the contact lever 9 so as to avoid forming electrical contact with the latter. The L-shaped armature lever 4 of the magnet 2 operates as a mechanical detent to at certain times hold the contact lever 9 from being thrown to its normal outermost position under the influence of the springs 13 and 14, and to this end the shorter or upper arm of said armature lever 4 is provided with an upstanding spring strip 17, which is so located and shaped that when the magnet 2 is energized the spring strip 17 will be carried into the path of movement of the end of the contact lever 9 and will, upon a subsequent energizing of the magnet 3, be depressed slightly in the closing movement of the contact lever and thereafter spring upwardly into the position shown in the drawings, and thus hold the contact lever mechanically when the magnet 3 is deenergized. A bell, designated as a whole 18, of the type commonly known as biased, is interposed in one of the

circuits, as will hereinafter more fully appear.

Referring to the diagram of the connections at "central," 19 designates an operator's key or switch lever, which is pivotally mounted at one end so as to sweep over a plurality of series of contact devices, as 20 and 21, and a continuous contact strip 22. The switch lever 19 comprises two distinct contact portions, namely, an outer or main portion 23, and an inner or inclosed portion 24, which parts are entirely insulated from each other, as indicated at 25. The respective parts of the pivoted end of the switch lever are permanently connected with the two sides of a source of electricity, as a battery H; the member 23 through a conductor 26, and the member 24 through a conductor 27. The two series of contacts, 20 and 21, are both connected with the left main line through conductors 28 and 29; said connections, for the sake of simplicity, being shown as made direct, it being understood that in practice the usual plug and jack connections will be interposed between central and the lines. The continuous conductor 22 is likewise connected with the right main line through a conductor 29', and the battery H is provided at one side with a grounded connection 30. It will be understood that the construction of the switch lever is such that the under side of its outer or main body 23 forms a continuous rubbing contact with the conductor strip 22 (except when the lever is in the open position shown in the drawing), while the parts 23 and 24 are respectively provided with downwardly extending buttons arranged to make and break contact with the corresponding members of the series of contact buttons 20 and 21 as the switch lever is moved over the same. The several contact members 31 and 32 of the two circular series are connected with each other by means of conductors 33 and 34 respectively.

Tracing now the circuits as they exist and are employed for securing signal and talking connections, and assuming that a call has been received by central from some subscriber belonging to another line who wishes connections with one of the subscribers belonging to the party line shown, and assuming further that the particular subscriber wanted upon the party line is that one located at the instrument designated B, the operation and connections will be as follows: The operator at central will move the switch lever toward the right, in which event the main body thereof will first make contact with the continuous strip 22, closing a circuit as follows: from ground at central through the battery and through conductor 26 to the main body of the lever, and from the latter to the contact strip 22, thence through the conductor 29' to the right main

line, and from the latter by a branch 35 to the angular armature lever 4 of the primary magnet of instrument A. From the latter a conductor 36 leads to and through the coil of the primary magnet, and thence to ground at 37, thus completing a circuit from ground to ground which energizes said primary magnet and draws the armature thereof into the position shown in the drawings. In this position of the armature lever 4, the continuation 38 of the main right line is interrupted at a back contact 39 with which the said armature lever normally is in contact. Inasmuch as the main right line is connected with each one of the succeeding instruments in the same manner as is instrument A, it follows that the opening of the circuit at the contact 39 prevents the energizing of the primary magnets of any of the succeeding instruments and a metallic circuit is next employed to operate magnet 3 and thus lock out instrument A. The moving of the armature lever 4 into closed position makes contact with a contact 40, which is connected by means of a flexible conductor 41 with the main body of the armature lever 10 of the secondary magnet, and from the latter the circuit is through the contact 15 hereinbefore referred to, and thence by way of a conductor 42 to and through the coils of the polarized secondary magnet 3. From the latter a conductor 43 leads out to the left main line. The further movement of the switch lever at central brings the member 24 thereof into electrical contact with the first contact 32 of the series 21, thereby completing a circuit from the left line through conductor 29 to the member 24 of the switch lever, and from the latter back to the opposite side of the battery. This completes the metallic circuit which includes the coils of the polarized secondary magnet, energizes the latter and places the armature and contact levers thereof in the position shown in the drawing. It may be noted in this connection that the contact between the armature lever 10 and the contact 15 remains closed while the magnet is in open position through the action of the expansion spring 14.

The leading object of energizing the magnet 3 is to place the contact lever 9 thereof in the position in which it is held advanced by the mechanical stop 17, so that upon a subsequent deenergizing of the magnet 3 it will remain in this position. At the same time the advance movement of said contact lever 9 operates to open a circuit extending through the contact screw 16 and a cooperating contact 44 mounted upon the armature lever 10, and which circuit will hereinafter be described.

The next step in the operation results in clearing or locking out the instrument A from the circuit, and enables the operator to

pass on and select a succeeding instrument. This placing of instrument A in locked-out position is effected by deenergizing the secondary magnet 3. Accordingly the operator at central continues the movement of the switch lever to the right until the circuit between contact 32 and the switch lever 24 is interrupted, thereby breaking the metallic circuit theretofore existing through said polarized magnet. This releases the armature 10, and the latter returns under the action of the spring 13 until arrested by a back contact screw 45 which is mounted in the longer arm of the contact lever 9; it being remembered that said latter arm is held against retraction by the mechanical stop 17. In this connection it is to be noted that the armature lever 10 is arrested before its contact plate 44 makes contact with the back stop screw 16. This same movement also results in opening the circuit between the armature lever 10 and the contact 15, thus opening the circuit through the secondary magnet 3. The closing of the circuit between the armature lever 10 and the contact screw 45 (which latter is insulated from the contact lever as shown) reestablishes a continuation of the right main line past instrument A, which may be traced from conductor 35 to armature lever 4, thence through contact 40 and conductor 41 to armature lever 10, thence to contact screw 45, and from the latter through a conductor 46 to the branch 38, which leads back to the continuation of the right line.

Instrument A having thus been placed in locked-out position, the next operation is to place the next instrument in order, B, in the same condition, or to select it if this instrument happens to belong to the subscriber wanted. In the example given, the instrument B is assumed to belong to the subscriber who is wanted, and accordingly the selecting operation will be as follows: Since the main body 23 of the switch lever at central is in constant circuit with the right main line through the continuous contact strip 22 as hereinbefore described, it follows that when the continuation of said right main line was reestablished at the contact screw 45 by deenergizing of the secondary magnet 3, the primary magnet of the next succeeding instrument was by the same movement energized and its armature drawn down, it being understood that the instrument B is connected up and grounded precisely in the same manner as is instrument A. The closing of the primary magnet at instrument B interrupts the main right line as to succeeding instruments, as hereinbefore described.

In the normal positions of the instruments, the several subscribers' local circuits are connected to line in parallel, as follows: from the left main line a branch conductor

47 leads to the left-hand side of the subscriber's set, and through the latter, a return conductor 48 leading back to the back contact screw 16, as shown clearly in the diagram. It will be understood, of course, that the subscriber's connections through his instrument are or may be the usual ones. The talking circuit may therefore be traced from left main line over conductor 47 through the subscriber's set, and back by conductor 48 to contact screw 16, thence to the contact 44 mounted upon but insulated from the armature lever 10, and from said contact 44 by a conductor 49 back to the main right line.

It now remains to ring this subscriber's bell in order to signal him, and the ringing circuit may be traced from central as follows: from right main line through conductor 35 to armature lever 4, thence through contact 40, conductor 41 and armature lever 10 to contact 15, and from the latter to the bell through a conductor 50. From the bell a conductor 51 connects with return conductor 43, which in turn leads back to the left main line, thus completing a metallic circuit through the bell. It will be understood, of course, that the ringing generator at central is put upon this circuit in the usual manner. It is also to be noted at this point that the bell 18 and the polarized secondary magnet 3 are connected in parallel with each other, and accordingly it is necessary to employ a bell of the biased type and a generator of the direct current pulsating type so that the bell may ring without energizing the secondary magnet. It will be understood, of course, that the polarity of the secondary magnet 3 is the opposite of that which effects the ringing of the bell. It is to be noted in this connection that since the instrument A and any other similar instruments intervening between the subscriber being called and central, have been placed in locked-out position, the circuits through their bells are open so that the bells are not affected by the current from the generator. It is also to be remembered that the instruments beyond the particular subscriber being called are likewise out of circuit by reason of the fact that the armature of the primary magnet of the subscriber's instrument being called is in closed position and the circuit, therefore, interrupted at the contact 39.

The subscriber having been called by the ringing of his bell, it only remains for him to remove his receiver from the receiver hook, whereupon his circuit is completed to line in readiness for talking. It will be seen from the foregoing that the particular subscriber's instrument thus called is effectually guarded against interference from other parties upon the same line in both directions, and this condition will continue so long as

the operator at central permits the switch key to remain in that position in which it was placed in giving the connections described. This means, however, that the primary magnets of all instruments intervening between central and the subscriber called, as well as the primary magnet of his instrument, remain in closed circuit, and accordingly current is being consumed during the time the conversation continues. If, however, it is desired to economize in the consumption of current, this can be accomplished by the operator at central returning the switch lever to its normal open position as soon as the particular subscriber wanted has been rung, in which event the returning of the switch lever will interrupt the circuit, and thus permit all of the instruments to resume their normal positions. In their normal positions they are properly connected to the line for talking purposes, but nevertheless are subject to interference by other parties upon the same party line.

The restoration of the switch lever 19 to normal position restores the line, whether this be done as soon as the desired party is called or after the ringing off signal has been received. The restoration of the instrument is due to the interruption of the flow of current from ground at "central" to ground through each of the several holding magnets 2; the latter being in parallel. Upon deenergizing magnets 2 the several retracting springs of their armatures draw back the angle levers, thus permitting the levers and associated parts to return to normal.

The parallel or bridging connections, comprising the conductor 47 leading to the subscriber's instrument, and the return conductors 48, 49 and 35, and screw and contact plates 16 and 44 interposed in the return circuit, perform another function in the operation of the system. That is to say, they form the means whereby any subscriber who has signaled in for a connection can be located by the central operator. Of course, if any given subscriber does not care for a "privacy connection" it is not necessary to locate his instrument, but in case he does, then the intervening subscribers and those beyond must be locked out. In such case, the subscriber by taking off his receiver closes the bridging connections through his set, which it will be noted short circuit the magnets of his instrument. Accordingly the operator at "central" simply sweeps her key or switch lever 19 over the set of contacts, and in so doing locks out the intervening instruments. Upon arriving at that instrument from which the call originated, the short circuiting shunt through the subscriber's set prevents the operation of the secondary relay of his instrument and in this manner prevents further running down the line, notwithstanding the switch lever sends to

line additional impulses after arriving at the selected set.

While it is thus possible to give any one of the subscribers upon the party line a locked-out connection, *i. e.*, such a connection that no other party upon the same line can interfere or listen, still in case it be desired to give talking connections between two subscribers upon the same party line, and at the same time prevent interference or listening on the part of other subscribers belonging to this line, it is necessary to provide a slightly modified form of instrument, which is shown in the diagram of the instrument designated C. In said instrument C, the same primary magnet 2 is employed, the same secondary polarized magnet 3, and substantially the same arrangement of armatures and armature levers for each. In this instance, however, the ringing of the bell is made to serve as a means of closing, and retaining a talking circuit connection, the construction and arrangement to this end being as follows: 60 designates as a whole the bell which is, as in the previous instances, of the biased type, and is in the present case located between the primary and secondary magnets. 61 designates the armature thereof, which is pivoted between its ends as indicated at 62, upon a suitable support; said armature being arranged substantially at right angles to the shorter arm of the armature lever 4 of the primary magnet. Mounted upon a suitable pivot support, at as for example, upon the pivot 62 of the armature, is a contact arm or lever 63, which extends substantially parallel with, and adjacent to one arm of the armature 61, and has its free end 64 located adjacent to a spring catch 65 mounted upon said shorter arm of the armature lever 4. Said contacting arm 63 normally rests against a stud or projection 61' upon the armature 61 so as to move positively with said armature in one direction. The ends of said spring catch 65 and of the contact arm 63 are inclined or beveled so that when said contact arm is oscillated by the receding movement of the lower end of the bell armature, it depresses the catch and passes into locked engagement with the latter. The catch 65 is in electrical contact with the armature 4, and through the latter with the branch line 35 leading to the right main line. The contact arm 63 is insulated from the armature upon which it is mounted, as indicated at 66, and is also connected with the subscriber's right line by means of a flexible conductor 67, so that when the said contact arm is moved into engagement with the catch, a circuit is closed which will remain unaffected by the interruption of the current through the secondary magnet 3. The effect of this construction and arrangement is that the operator at central can lock any one of

the subscribers having an instrument like that last described, on to the line by simply ringing his bell, and thereafter proceed to make the proper connections with another instrument upon the same party line, notwithstanding in so doing the secondary magnet of said instrument C be deenergized. Inasmuch as the catch is carried upon the end of the armature 4, and is only brought within the path of the contact arm 63 when the primary magnet is energized, it follows that when the latter magnet is deenergized or released, the contact arm 63 is likewise released and returns to its normal position under the tension of a V-spring 62'. The connections and operation of the instrument in other respects are identical with those of the instrument A and B hereinbefore described, and need not therefore be repeated.

It now remains to describe the function of the outer series of contacts 20 and the circuits connected therewith. It will be obvious from the foregoing description of the circuit connections that the placing of the left main line to ground, either by one of the subscribers removing his receiver and thus closing a circuit at his station, or by the accidental closing of the left line to ground, in any other manner would have a similar effect to that produced by the operator at central in closing the circuit by means of the switch lever key. Such grounding of the circuit would tend to form a continuous circuit through the secondary magnet, and hence prevent the release of the same in response to the manipulation of the operator's key at central. In order to obviate this contingency, I provide the outer series of contacts 20, which are connected with the left main line through the conductor 28; the several terminal or contact devices 31 being so located as to make contact with the main body of the switch lever alternately with the inner series of contacts 32. This results in placing both main lines in circuit with the same side of the battery simultaneously, and thereby eliminates the difference in potential existing between the lines, and thus renders certain the release of the secondary magnet.

In Fig. 5 I have shown diagrammatically two other forms of the invention; the two instruments being so nearly alike that they are shown connected up in the same circuit, although in the one instrument the subscriber's set is normally cut off from the line, while in the other instrument the subscriber is normally properly connected for talking.

Describing first the instrument which is designated as a whole O, 300 designates the main frame upon which are mounted the primary magnet 301, a clearing magnet 302 and a biased bell 303. The armature 304 and contact lever 305 of the primary magnet

are so nearly alike those hereinbefore described in construction and operation as to be readily understood. The armature 306 of the biased bell and a contact arm 307 are also substantially like the corresponding elements shown and described in connection with diagram Fig. 1. The clearing magnet 302 coöperates with an armature 308 mounted upon an armature lever 309, as shown clearly in the diagram. The circuits are as follows: The drop at central is operated over the left hand main line, a magneto 310, being shown as adapted to be grounded upon operation in the usual manner and connected with the left-hand side at the subscriber's instrument. The circuit, therefore, is from ground through the magneto over a conductor 311 to and through the coil or magnet 302, and thence to main left wire over a conductor 312 and to drop at central. The circuit for cutting out instrument O or passing on to select an instrument beyond may be traced as follows: from right main line through a conductor 313 through the armature lever 304 which normally rests in engagement with contact 314 of the contact lever 305, thence through the primary magnet and over a conductor 315 to a conductor 316, which forms a part of the left side. Conductor 316 is connected with conductor 311, which as hereinbefore described, leads through the clearing magnet and back to left main line, thus completing the circuit. The energizing of the primary magnet draws down its armature, thus moving the contact lever 305 into mechanical engagement with a spring latch 317. When the circuit is opened at central, the armature returns under the action of its spring 318 until a back contact thereon, 319, engages with a co-operating contact plate 320 mounted upon and insulated from longer arm of the lever 305. The opening movement of the armature lever opens the circuit through the primary magnet of contact 314, and closes the circuit from the right hand main line through conductor 313 and armature lever 304 to the said back plate 320, and thence to a continuation of the main right line beyond this instrument by a conductor 321. It will be obvious from the foregoing that the operator at central can pass or cut out instrument after instrument until the desired one is reached.

Having thus arrived at the instrument of the subscriber wanted, central simply puts on the ringing current, which it is to be noted is of opposite polarity from that required to operate the primary magnet. The ringing circuit may be traced as follows: from central over the right line to and through the armature lever to contact 314, as before. The conductor leading thence to the primary magnet divides, and a branch conductor 322 leads to and through the coils of

the bell magnet, and thence to conductor 316 and back over left, as before. The energizing of the bell magnet actuates the armature thereof, which upon its first movement throws back the contact lever 307 into latched engagement with a spring latch or detent 323, thus making connections for two circuits, namely, the talking circuit and a ground circuit at this subscriber's instrument. The talking circuit is as follows: The subscriber's left-hand side is connected to the left main line permanently through conductor 311, as hereinbefore described. The right-hand side of his instrument is connected through a conductor 324 with the contact lever 307, and from the latter through the detent or latch 323 to the right main line by a conductor 325, leading to and connected with, conductor 313. The subscriber, it is to be noted, is also at this time connected with the extensions of the right and main lines beyond his instrument as follows: from left side of his instrument through conductor 311 to conductor 316 and to left, and from the right side of his instrument through conductors 324, armature lever 307, detent 323, conductor 325, to armature 304 of the primary magnet, and from the latter to the contact plate 320 hereinbefore described, and thence out to the right line through conductor 321.

The grounding connections hereinabove mentioned are provided for the purpose of grounding the instrument last called to provide for the clearing circuit which follows after the subscriber has finished talking. Upon the back side of contact lever 307 is mounted an insulated contact plate 326, which is permanently connected to ground at 328 through a conductor 327. A yielding contact 329 is mounted adjacent to the contact plate 326 so as to engage the latter when the lever is in locked position, and this contact is connected through a conductor 330 with a contact device 331 mounted below the switch lever of the subscriber's instrument and adapted to coöperate with the contact plate 332 mounted upon the lower side of said lever. The contact plate 332 is connected permanently with the left hand side of the subscriber's set through a conductor 333; the arrangement being such that when the subscriber's receiver is hung upon the switch lever, the connection is made from the left hand side of his instrument to ground at 328.

The clearing circuit is as usual operated from central, and by putting upon the left hand main line a current of sufficient volume to operate all of the clearing magnets 302 in series between ground at the subscriber's instrument last called and central. The clearing circuit may be traced from the left main line at the last called subscriber's instrument to ground through conductors 13.

312, magnet 302, and conductor 311 to the subscriber's instrument, thence to contact 332 over conductor 333 and from contact 331 over conductor 330, and contact 329 to contact plate 326, and thence to ground over conductor 327.

Since it is desirable that any subscriber may be so connected with the line wires that he may be able to talk with central as soon as the operator at central responds after he has sent in a signal for connection, I provide a contact screw 320' which is mounted in the main frame and arranged to extend through an aperture in the contact lever 305, and engage the armature 304 when the latter is in its normal open position; said contact screw being arranged to pass through an insulating opening 305'' in the contact lever so as to prevent forming electrical contact therewith. The contact screw is permanently connected with the contact lever 307 by means of a conductor 324', so that in the normal position of the instrument the right hand side of the subscriber's instrument is connected to the left hand right line through conductor 324, contact lever 307, conductor 324', contact screw 320' and armature 304, which latter, as hereinbefore described, is permanently connected to the right line through conductor 313.

Inasmuch as the return of the contact lever 307 to its normal position operates to cut off the ground at contact 329, it is desirable to provide against the contingency of the clearing circuit being opened at this point before the clearing magnets of the intervening magnets have been operated. This is accomplished by the use of a peculiar form of latch mechanism or detent 323 which is so constructed that the contact lever 307 is not released upon the downward or closing movement of the armature lever 309, but upon the return of the latter. To this end the head or engaging end of the detent 323 is approximately of diamond shape, as indicated at 338 in Fig. 6, and the contact lever 307 is provided with an obliquely disposed aperture 335, see detail Fig. 6, the upper and lower inclined surfaces 336 and 337 of which respectively coöperate with the correspondingly inclined surfaces 338 and 339 of said head. When the contact lever is forced outwardly, the surface 336 thereof acts upon the surface 338 cam-fashion, forcing the latch member downwardly and into engagement with the latter. When the armature lever of the clearing magnet moves downwardly, and with it the detent 323, the contact lever is permitted to drop back under the action of its spring only far enough to bring the inclined surface 337 thereof into engagement with the lower inclined surface 339 of the detent head, and so long as the armature lever is held down it will be retained in this position. As soon, however, as

the armature lever begins to rise, the contact lever moves backwardly or follows the inclined surface 339 thereof until it passes out of engagement.

The selective instrument shown at P in this diagram is the same in all substantial respects except that it is provided with such additional features as result in maintaining the subscriber located at this instrument in talking connection with the main lines at all times except when locked out during the use of the line by other subscribers. These additional features are as follows: In the instrument designated O the right hand main line is normally open at the contacts 319 and 320 so that, unless the subscriber at this instrument happens to be the one nearest to central on the line, it is impossible for him to talk until connected in.

In the instrument now being described, an insulated back contact device 400 is provided upon a suitable support 401 and arranged to coöperate with a contact plate 402 mounted upon the back side of the contact lever 305'. The contact plate 402 is permanently connected to conductor 313 leading to the right line by means of a conductor 403 while the back contact 400 is connected by means of a conductor 404 with an insulated contact device 405 mounted upon the under side of the contact lever 307'. The contact 405 normally rests in engagement with a contact device 406, which latter is connected permanently to the extension of the right line through a conductor 407. The subscriber's connection with the right-hand extension of the right main line may therefore be traced from his instrument to contact lever 307' through conductor 324, thence to contact screw 320'' over conductor 324'', from said contact screw to the armature lever 304', thence by conductors 313 and 403 to contact plate 402 and contact device 400, thence over conductor 404 to contacts 405 and 406, and thence to line over conductor 407. The subscriber's left hand side is connected to the main left lines on both sides of his instrument permanently, the same as described in connection with instrument O.

It will be seen from the foregoing description that I accomplish the several objects of the invention set forth, and provide a system which may be adapted to any ordinary telephone line at a very moderate expense, and by the use of apparatus of an extremely simple nature and therefore not easy to get out of repair or adjustment. It will furthermore be seen that the details of the embodiment of the system may be very considerably modified without in any sense departing from the spirit of the invention, and accordingly I do not limit myself to the details of construction and arrangements herein shown except to the extent that they are specifically claimed.

I claim as my invention:

1. In a party line telephone system, a sectional line extending from the central station to the first sub-station, and from sub-station to sub-station beyond, each section at its terminal portion normally connected to a return circuit, a magnet in circuit with the terminal portion of each section, a set of contact devices for connecting the terminal portion of each section to the succeeding section, a magnetically controlled mechanism at each sub-station for effecting the closing of said contacts, said mechanism operating to place and hold said contacts in condition to close during energization of the controlling magnet and operating to effect actual closing of said contacts upon deenergization of the magnet, whereby said sectional line is built up by successive impulses, but current cannot flow to the succeeding station during that impulse which effects the closing of the circuit leading thereto.
2. In a party line telephone system, a sectional line extending from the central station to the first sub-station, and from sub-station to sub-station beyond, each section at its terminal portion normally connected to a ground return circuit, a magnet in circuit with the terminal portion of each section, a set of contact devices for connecting the terminal portion of each section to the succeeding section, a magnetically controlled mechanism at each sub-station for effecting the closing of said contacts, said mechanism operating to place and hold said contacts in condition to close during energization of the controlling magnet and operating to effect actual closing of said contacts upon deenergization of the magnet, whereby said sectional line is built up by successive impulses, but current cannot flow to the succeeding station during that impulse which effects the closing of the circuit leading thereto.
3. In a party line telephone system, a sectional line extending from the central station to the first sub-station, and from sub-station to sub-station beyond, each section at its terminal portion normally connected to a return circuit, a magnet in circuit with the terminal portion of each section, normally open contact devices for connecting the terminal portion of each section to the succeeding section, a magnetically controlled mechanism at each sub-station for effecting the closing of said contacts, said mechanism operating to place and hold said contacts in condition to close during energization of the controlling magnet and operating to effect actual closing of said contacts upon deenergization of the magnet, a normally open shunt circuit at each sub-station, adapted to short circuit the magnet which effects the building up of the sectional line, and a

manually operable contact device for closing said shunt circuit.

4. In a party line telephone system, the combination of a central station, a pair of metallic line wires extending therefrom through a plurality of sub-stations, one of said lines being in sections extending from the central station to the first sub-station, and from sub-station to sub-station beyond, means operable from the central station for sending counted out impulses for successively establishing a bridging connection between the sectional and other line wire at each station, and means for disconnecting the sectional line wire from the succeeding station.

5. In a party line telephone system, the combination of a pair of line wires extending from the central station through a plurality of subscribers' stations, one line being in sections extending from station to station and the other continuous, means for establishing a bridging connection between the sectional line and continuous line at each sub-station, and means operable from the central station for establishing a grounded return circuit at each sub-station.

6. In a party line telephone system, the combination of two line wires extending from a main operating station through a plurality of sub-stations, one line being in sections extending from station to station, means for establishing a bridging connection between the sectional and other line wire at each station and for simultaneously disconnecting the sectional line wire between the bridged station and the succeeding station, and a primary relay arranged in a grounded branch at each sub-station, operating to restore the line connections at said stations to their normal positions.

7. In a party line telephone system, the combination of a central station, a pair of line wires extending therefrom through a plurality of sub-stations, one line being in sections extending from station to station, and both normally closed throughout their length, means for establishing a normally open bridging connection between the sectional and other line wire at each station and for disconnecting said sectional line wire between the bridged station and the succeeding station, an annunciator in circuit with said bridging connection and talking circuit connections controlled by the instrumentalities operative to effect such bridging connections.

8. In a party line telephone system, the combination with a central station and a pair of line wires extending therefrom through a plurality of sub-stations, one line being in sections extending from station to station, a relay in a grounded branch line connected with one of said main lines at each sub-station, a bridging connection be-

tween the main lines controlled by said grounded relay at each station, a second relay in said bridging connection and contacts operated thereby for connecting the contiguous ends of the sectional main line.

9. In a party line telephone system, the combination with a central station and a pair of line wires extending therefrom through a plurality of sub-stations, one line being in sections extending from station to station, a relay in a grounded branch line connected with one of said main lines at each sub-station, a bridging connection between the main lines controlled by said grounded relay at each station, a second relay in said bridging connection and contacts operated thereby for connecting the contiguous ends of the sectional main line, and an annunciator arranged in a circuit controlled by said second relay.

10. In a party line telephone system, the combination of a pair of line wires extending through a plurality of subscribers' stations, one line wire being in sections extending from a central station and from sub-station to sub-station, means for establishing a bridging connection between the sectional line and other line at each station, a polarized relay in circuit with such bridging connection at each station, contacts controlled by said polarized relay and operating when current of one polarity is sent therethrough to connect the disconnected sectional line and extend the circuit to a succeeding station, and an annunciator controlled by said polarized relay and operable when current of the polarity opposite that which effects the building up of the sectional line is sent through the relay.

11. In a party line telephone system, the combination of a pair of line wires extending through a plurality of subscribers' stations, one line wire being in sections extending from a central station and from sub-station to sub-station, means for establishing a bridging connection between the sectional line and other line at each station, a polarized relay in circuit with such bridging connection at each station, contacts controlled by said polarized relay and operating when current of one polarity is sent therethrough to connect the disconnected sectional line and extend the circuit to a succeeding station, an annunciator controlled by said polarized relay and operable when current of the polarity opposite that which effects the building up of the sectional line is sent through the relay, and means operable from the central station for restoring the mechanism at each sub-station to normal.

12. In a party line telephone system, the combination with a central station of a pair of line wires extending therefrom through a plurality of sub-stations, one line being in

sections extending from station to station, means for establishing a bridging connection between the sectional and other line wire at each station, and for disconnecting the sectional line wire as to the succeeding station, the relay operating to disconnect the line wire as to a succeeding station operating also to cut itself out of the main circuit thus established between the central and sub-stations.

13. In a party line telephone system, the combination with a central station of a pair of line wires extending therefrom through a plurality of sub-stations, one line being in sections extending from station to station, means for establishing a bridging connection between the sectional and other line wire as to the succeeding station, the relay operating to disconnect the line wire as to a succeeding station operating also to cut itself out of the main circuit thus established between the central and sub-stations, and means for restoring the system to its normal or initial condition.

14. In a party line telephone system, the combination with a central station and a plurality of subscribers' sets arranged at a plurality of sub-stations, of a sectional line wire extending from station to station, means for successively and progressively establishing return circuits from said line wire at each sub-station to the central station to the exclusion of all other sub-stations, and means for successively and progressively connecting the terminal portion of each line section to the succeeding line section, comprising a set of contact devices and a magnetically controlled mechanism for actuating said set of contact devices at each sub-station, said mechanism operating to place and hold said contacts in condition to close, during energization of the controlling magnet and operating to effect actual closing of said contacts upon deenergization of the magnet.

15. In a party line telephone system, the combination with a suitable subscriber's set and a selecting circuit extending there-through, of a polarized ringer, a set of contact devices controlling said selecting circuit, and operative connections between the armature of said polarized ringer and the movable member of said contact devices, whereby the ringer coöperates in effecting the selection of its station.

16. In a party line telephone system, the combination with a suitable subscriber's set and a selecting circuit extending there-through, of a polarized ringer, a set of contact devices controlling said selecting circuit, and operative connections between the armature of said polarized ringer and the movable member of said contact devices, whereby the ringer coöperates in effecting the selection of its station, the operative con-

nections between said armature and contact devices being such that the armature is free to vibrate practically unrestrainedly after the first contact actuating movement thereof.

- 5 17. In a party line telephone system, a sectional line extending from the central station to the first sub-station and from sub-station to sub-station beyond, each section at its terminal portion normally connected
10 to a return circuit, a magnet inserted with the terminal portion of each section, normally open contact devices for connecting the terminal portion of each section to the succeeding section, a magnetically controlled mechanism at each sub-station for effecting
15 the closing of said contacts, said mechanism operating to place and hold said magnets in condition to close during energization of the controlling magnet and operating to effect actual closing of said contacts upon de-
20 energization of said magnet, and manually operable means at each sub-station for controlling said normally open contact devices which effect the building up of the sectional
25 line to render the latter functionally inoperative, whereby the subscriber may place his station in condition to be automatically selected by arresting the building up of the line thereat.
- 30 18. In a party line telephone system, the combination of a central station, a pair of metallic line wires extending therefrom through a plurality of sub-stations, one of said lines being in sections extending from
35 the central station to the first sub-station, and from sub-station to sub-station beyond, the terminal portion of each line section forming a bridging connection with the other metallic line, means operable from the
40 central station for sending counted-out impulses, and electromagnetic means at each sub-station operable by said counted-out impulses and acting to change the circuit upon deenergization for successively building up
45 the sectional line by switching the terminal portion of each section to the contiguous portion of the succeeding section.
- 50 19. In a party line telephone system, the combination of a pair of line wires extending through a plurality of subscribers' stations, one line wire being in sections extending from a central station and from sub-station to sub-station, bridging connections from the terminal portion of each section to
55 the other line wire at each sub-station, a polarized relay in circuit with such bridging connection at each station, contacts controlled by said polarized relay operated when current of one polarity is sent there-
60 through to disconnect the sectional line and extend the circuit to a succeeding station, said contact operating to change the circuit during deenergization of said polarized relay, and an annunciator controlled by said
65 polarized relay and operable when current

of the polarity opposite that which effects the building up of the sectional line is sent through the relay.

20. In a telephone system, the combination with a central station, a plurality of subscribers' sets arranged at a plurality of sub-stations and a line wire extending from station to station, of means for successively and progressively establishing return circuits from each sub-station to the central station to the exclusion of other sub-stations, and means for arresting the progressive closing of said circuits at each sub-station, said means being under the control of the subscriber.

21. In a party line telephone system, the combination with a central station and a series of sub-stations, of a main wire extending from the central station to and through the several sub-stations, electromagnetic selecting mechanism at each sub-station, means for establishing ground connections with said main wire at the terminal end thereof and at said central station, and restoring magnets arranged in series in said main wire, one at the selected sub-station and one at each intervening sub-station, whereby the selecting mechanism may all be restored by a single impulse as serially through said restoring magnets.

22. In a lock out telephone system, a series substations, a subscriber's talking set and a ringer magnet at each substation, means for successively and separately establishing operating circuits through the several magnets, circuit connections controlled by each ringer for controlling its associated talking set, and electromagnetic means at each substation for restoring said talking set to normally locked-out condition.

23. In a lockout telephone system, a series of substations, a subscriber's talking set and a ringer at each substation, a latch mechanism and circuit connections controlled thereby for alternatively placing the associated subscribers talking set in operative or disabled condition, means operated by said ringer for setting said latch in one position and electromagnetic means for returning said latch mechanism to its other position.

24. In a party line telephone system, the combination with a central station, a plurality of sub-stations and circuit connections from the central station through the several sub-stations, of station-selecting mechanism at each sub-station, a ringer controlled by each selecting mechanism, a normally open branch-circuit extending from one of the line wires to ground, and contacts operated by said ringer for closing said ground connection.

25. In a multiple station telephone line, the combination with a conductor extending to each of the telephone stations thereon and

to a central office, the same being normally open at intermediate stations, of an electromagnetic switching device at such stations adapted for operative actuation upon the cessation of its energizing current, the same controlling contacts governing the continuity of said conductor to the next succeeding station, a restoring electro-magnet associated with the said switching device, an uninterrupted line conductor extending to each of said stations and to the central office connected with said restoring electro-magnet, and means comprising a source of electric current, controlled at a central office for successively actuating the switching devices to extend the conductor to any desired station and restoring the same to normal condition.

26. In a multiple station telephone line, the combination with metallic line conductors extending through a plurality of telephone stations, one of said lines being broken at said telephone stations, of an electromagnetic switching device at each intermediate station comprising an electro-magnet, contacts controlled by said electro-magnet for continuing the telephone circuit to the succeeding station, said contacts being so arranged as to extend the circuit only on the deenergizing of their electro-magnet, an electro-magnetic restoring device associated with said switching device and connected to one of said line conductors for returning said switching device to its normal condition, and mechanism at the central station for controlling the switching and restoring devices.

27. In a multiple station telephone line, the combination of a conductor extending from "central" to each of the telephone stations, the same being in sections extending from station to station, and electro-magnetic switching device at each sub-station, the same controlling contacts governing the con-

tinuity of said conductor to the next succeeding station, a restoring electromagnet associated with said switching device, means for establishing a return circuit from each sub-station to the central station, and means including a source of electric current, at the central office, for successively actuating the switching devices and for actuating the restoring devices.

28. In a multiple station telephone line, the combination of a conductor extending from "central" to each of the telephone stations, the same being in sections extending from station to station, an electromagnetic switching device at each sub-station, adapted for operative actuation upon the cessation of its energizing current, the same controlling contacts governing the continuity of said conductor to the next succeeding station, a restoring electromagnet associated with said switching device, means for establishing a return circuit from each sub-station to the central station and through the restoring electromagnet, and means including a source of electric current, at the central office, for successively actuating the switching devices and for actuating the restoring devices.

29. In a telephone system, a polarized relay, a latching mechanism cooperating with the armature of said relay to lock the latter in closed position when the relay is energized with current of one polarity and to remain ineffective when the relay is energized with current of opposite polarity, a restoring magnet and an armature controlled by said restoring magnet and operative to trip off said latching mechanism upon energization of said restoring magnet.

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Witnesses:

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