

(No Model.)

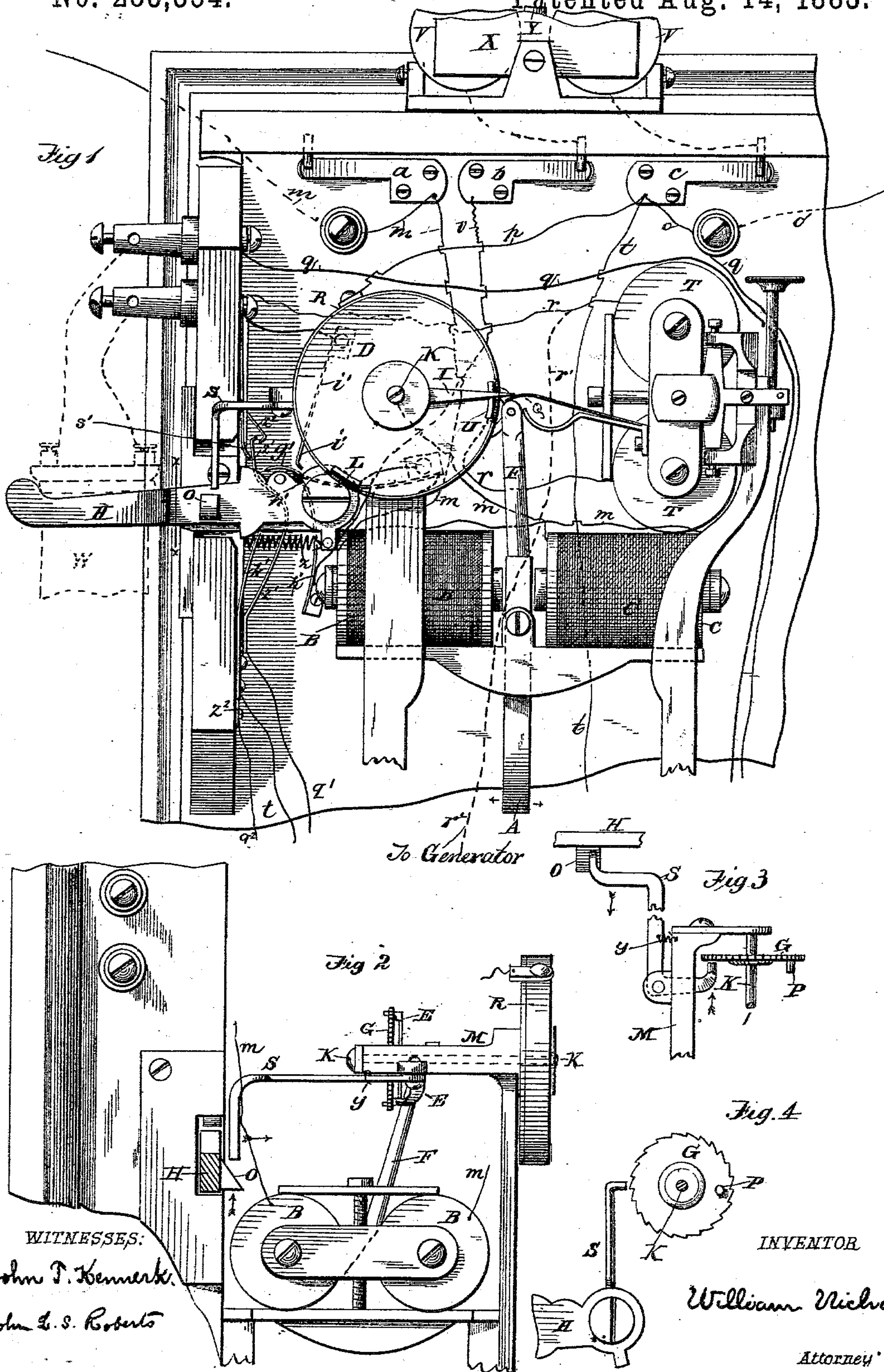
2 Sheets—Sheet 1.

W. NICHOLS.

TELEPHONE LOCAL CALL INSTRUMENT.

No. 283,354.

Patented Aug. 14, 1883.

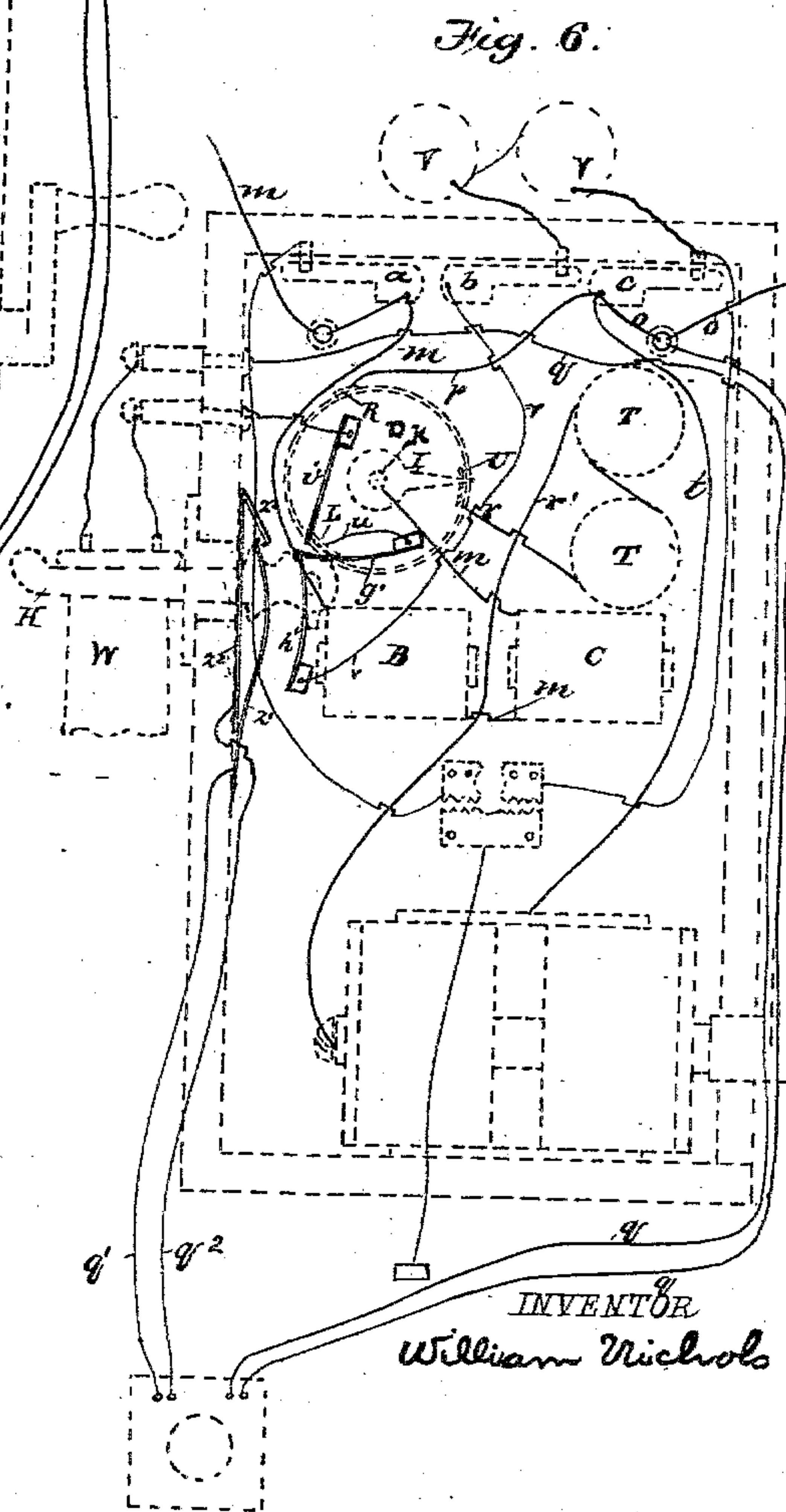
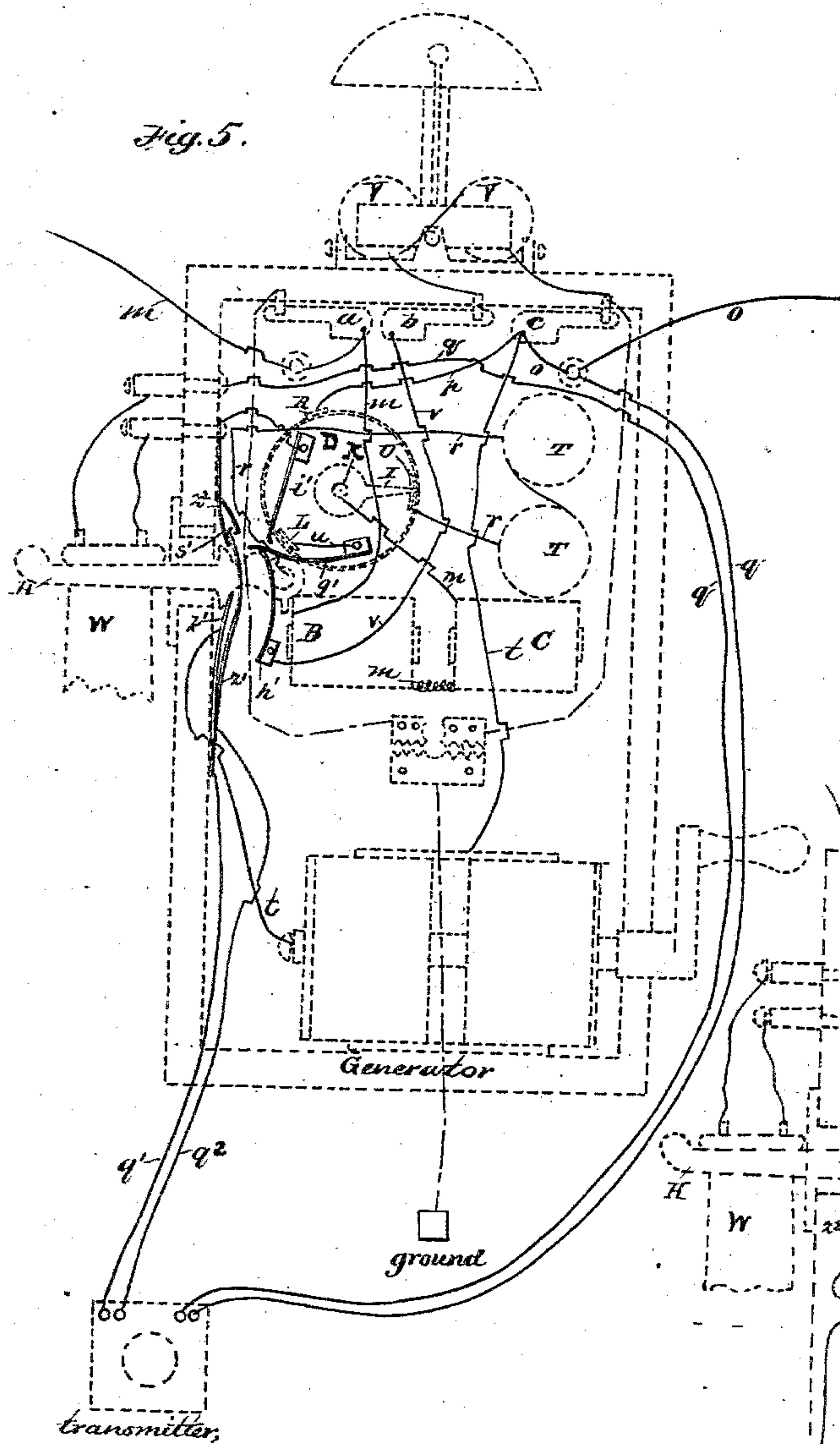


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WITNESSES:

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# UNITED STATES PATENT OFFICE.

WILLIAM NICHOLS, OF BOSTON, MASSACHUSETTS.

## TELEPHONE LOCAL-CALL INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 283,354, dated August 14, 1883.

Application filed October 14, 1882. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM NICHOLS, of Boston, Suffolk county, Massachusetts, have invented a new and useful Improvement in  
5 Switches for Telephonic Circuits, of which the following description, in connection with the accompanying drawings, is a specification.

My invention has for its object to secure secrecy, safety, simplicity, and celerity in communication between subscribers on the same  
10 telephone-line, or different lines temporarily in circuit. It applies to that class of station-instruments forming a series in which a movable switch is an element in the connections,  
15 making a telephone a part of the circuit.

It consists in a stop operated to hold such a switch from moving out of connection in response to any agency actuating corresponding  
20 switches in the instruments of the series whenever subscribers on the same line or on different lines are to be kept in communication with each other, the telephones of the rest being cut out.

It also consists in an automatic switch and  
25 a single connection by which a telephone is put in circuit only when a movable switch rests on the local switch or bell-shunt of an instrument in a series.

In carrying out my improvement I have  
30 used it in connection with the local-call instrument for telephone-lines described in Patents Nos. 235,058 and 265,454, issued to James P. Stabler November 30, 1880, and October 3, 1882, respectively, and so much of the same as  
35 is necessary to illustrate my invention is figured in the accompanying drawings. The lines and connections, so far as concerns the first part of my invention, are the same as shown and described in said patents, and reference is hereby made to said patents for details of construction not necessary to be specified herein.

In the patents referred to each instrument in the series has a dial, index, two electro-  
45 magnets with helices wound in opposite directions, between which vibrates a polarized armature carrying a standard with pawls operating a ratchet-wheel on the axis of the index. The dial has a conductor-rim cut away  
50 opposite a unison-shunt and a local bell-shunt in each instrument. The unison-shunt is located alike in each instrument. The local or

bell shunt is located according to the position of the particular instrument in the series. The index sweeps over the rim and interposed  
55 shunts, is always in the circuit, and is actuated by means exclusively under the control of the operator at the central office. A to-and-fro current sent from the central office over the line through the motor-magnets causes the vi-  
60 brating armature to move the index in each instrument synchronously with those of the others in the series. The operator, either manually or by an automatic device at the central office, grounds the current and halts the  
65 index in its revolution at any desired point. The index extending beyond the rim of the dial, a detent-arm mounted on the vibrating armature of an electro-magnet normally intervenes in its path at a unison-point located alike  
70 in each instrument. The unison-shunt has an electrical connection with this detent-magnet. The local shunt connects with the bell-magnet. The current which actuates the index has not  
75 strength to affect the detent-magnet or the bell-magnet, but if the index be on the unison-shunt or on a local shunt, the operator, by applying a special electric instrumentality, can send over the line a current of greater strength  
80 and of a single polarity, which acts to draw aside the detent and release the index of each instrument, or to sound the bell of a particular instrument, as the case may be.

The rim and shunts being alternately in the line-circuit, the device outlined above, and as  
85 covered by Patent No. 235,058, enables the operator to bring the indexes of all the instruments in the line into unison to move and stop them together, to sound the bell-call of any instrument, and to cut out the bells of the rest.  
90 The arrangement of this device, however, permitted conversation between two persons to be heard and interrupted by the voluntary act of others, and gave no visual notice of the line being in use when persons on the same line  
95 were in communication.

The improvements covered by Patent No. 265,454 were intended to remedy these defects in the following manner: A double connection  
100 with the unison and local shunt, when the receiver is taken from the hook, puts the telephone used with each instrument in circuit with either the unison or the local shunt between the central office and the bell-call, ac-



cording as the index rests on the one or the  
 other of these shunts. This makes it possible,  
 when two persons on different lines are talk-  
 ing, to secure the same privacy of communica-  
 5 tion to those on combination-lines that is en-  
 joyed by subscribers having individual con-  
 nection with the main office. The indexes of  
 all the instruments are normally kept at the  
 unison-point when the line is not in use, con-  
 10 stituting a visible signal. By a connection  
 with the unison-shunt, when the receiver is on  
 its hook-lever, a subscriber can put the gen-  
 erator of his instrument in circuit and send a  
 current over the line to drop the annunciator  
 15 at the central office. By the telephone-con-  
 nection with the unison-shunt, on removing  
 the receiver, he communicates his instructions  
 to call a person on another line to the operator.  
 The latter moves the index of the subscriber's  
 20 instrument upon its local shunt, and after a  
 like operation on the proper instrument on the  
 other line sounds the bell of the person to be  
 called. By their connections with the local  
 shunts the telephones of these two instruments  
 25 are put in circuit. The telephones, bells, and  
 generators of the other instruments on the two  
 lines are cut out. On the other hand, after  
 notifying a subscriber that another on the same  
 line desires to communicate with him, it is  
 30 necessary for the operator first to bring all the  
 indexes to the unison-point, then to release the  
 detents in order to advance the indexes the  
 distance of one station upon an extension of  
 the unison-shunt, or on a shunt located alike  
 35 in each instrument and having an automatic  
 connection with the telephone when the re-  
 ceiver is removed from its hook. This pro-  
 vides visual notice of the line being in use to  
 prevent unwitting overhearing or interrup-  
 40 tion, but avails nothing against willful inter-  
 meddling, and secures no secrecy.

Figure 1 of the accompanying drawings  
 shows a front elevation of an application of  
 my invention to the local-call instrument, the  
 45 operation of which has just been explained.  
 Fig. 2 shows a side elevation. Fig. 3 shows a  
 top plan view. Fig. 4 shows a modified form  
 of the same and certain details of construction.  
 Fig. 5 is a diagram of the circuits of Fig. 1  
 50 apart from the stop mechanism and other  
 parts. Fig. 6 is a diagram illustrating the  
 simplification of the connections of the unison-  
 shunt given in Fig. 5, which constitutes the  
 second part of my invention.

55 D represents the dial; I, the index-switch;  
 K, the axis; G, the actuating ratchet-wheel;  
 A, the polarized armature, carrying the stand-  
 ard F, with pawls E E, operating the ratchet-  
 wheel; B C, the motor-magnets; M, the frame;  
 60 R, the conductor-rim; U, the unison-shunt; L,  
 the local or bell shunt; T, the detent-magnet;  
 W, the receiver; H, the hook-lever; O, the  
 inclined stud; S, the stop-arm;  $y$ , its spring;  
 $z'$ , a contact-spring, depressed by the hook-  
 65 lever when the receiver rests upon its hook,  
 but striking against the contact-spring  $z^2$  when

the hook-lever is elevated, thereby closing the  
 primary circuit of the transmitter, with which  
 $z'$  and  $z^2$  are connected by wires  $q'$  and  $q^2$ , re-  
 spectively;  $q$ , the secondary circuit through 70  
 the transmitter; P, the pin in the ratchet-  
 wheel; V, the bell-magnet; X, its armature,  
 carrying the bell-striker Y;  $a b c g'$ , contact-  
 springs;  $h' i' k' s'$ , switch-springs,  $i' s'$  connect-  
 ing with the telephone;  $m o$ , the main line; 75  
 $p$ , the wire from conductor-rim R to contact-  
 spring  $c$  and line  $o$ ;  $p'$ , the wire from unison-  
 shunt U to the detent-magnet T and switch-  
 spring  $k'$ ;  $t$ , the wire from switch-spring  $k'$  to  
 the generator-frame, contact-spring  $c$ , and line 80  
 $o$ ;  $u$ , the wire from local shunt L to contact-  
 spring  $g'$ ;  $v$ , the wire from switch-spring  $h'$  to  
 contact-spring  $b$  and bell-magnet V;  $r'$ , the di-  
 rect connection between the detent-magnet and  
 generator in place of the connection by wire  $r$ , 85  
 hook-lever, switch-spring  $k'$ , and wire  $t$ . The  
 other letters are the same as those indicating  
 like parts in Patent No. 265,454.

Referring to Figs. 1 and 5, the current comes  
 in from the line  $m$  by way of the motor-magnets 90  
 B C and axis K to the index I, which is always  
 in the circuit. The conductor-rim R is cut  
 away opposite the unison-shunt U and local  
 bell-shunt L. When the receiver hangs upon  
 its hook, it throws down the pivoted hook- 95  
 lever H upon the switch-spring  $k'$ . If the in-  
 dex be on the unison-shunt U, the current  
 passes by the wire  $r$ , detent-magnet T, wire  $r'$ ,  
 hook-lever H, switch-spring  $k'$ , wire  $t$ , gener-  
 ator-frame, continuation of wire  $t$ , and contact- 100  
 spring  $c$  to line  $o$ . A subscriber can put the  
 generator of his instrument in this circuit to  
 call the central-office operator. If the index  
 be on the rim R, the current is short-circuited,  
 passing by the wire  $p$  to contact-spring  $c$ , and 105  
 line  $o$ . If the index be on the local-shunt L,  
 the current passes by wire  $u$  to contact-spring  
 $g'$ , switch-spring  $h'$ , wire  $v$ , contact-spring  $b$ ,  
 bell-magnet V, and contact-spring  $c$  to line  $o$ .

The rim, unison, and local shunts being al- 110  
 ternately in circuit, according to the position  
 of the index, the operator sends from the cen-  
 tral office a current of a single polarity and  
 of a greater strength than the to-and-fro cur-  
 rent used to move the index, which, through 115  
 the connections above set forth, acts through  
 the magnet T to operate the detent Q, to re-  
 lease the index synchronously in each instru-  
 ment of the series, or to sound the bell in any  
 desired instrument, according as the index 120  
 rests on the unison or on the local shunt. A  
 to-and-fro current, too weak to effect the de-  
 tent-magnet or bell-magnet, sent over the line  
 from the central office causes the armature A  
 to vibrate between the motor-magnets B C, 125  
 and, by means of the standard F, pawls E E,  
 ratchet-wheel G, and axis K, to move the in-  
 dex synchronously with those of the other  
 instruments of the series, over the dial-rim  
 and interposed shunts, it being halted upon 130  
 its local shunt at the will of the operator by  
 grounding the current at the central office,



while the indexes of the other instruments are halted at corresponding points on their dial-rims.

A double connection with the unison-shunt 5 and the local shunt, when the receiver is taken from its hook, puts the telephone in each instrument in circuit, according as the index rests upon one or the other of these shunts. This double connection and its action are as follows: When the receiver W is removed, 10 the hook-lever H is raised by its spring  $z$  to break contact with switch-spring  $k'$  and make contact with switch-spring  $s'$ , which connects with the telephone. The lever at the same 15 time acts to throw up the contact-spring  $g'$ , causing it to break contact with switch-spring  $h'$  and make contact with switch-spring  $i'$ , which connects with the telephone. If the index be on the local shunt L, the current 20 passes thence by the wire  $u$ , contact-spring  $g'$ , and switch-spring  $i'$  to the telephone. If the index be on the rim, neither the telephone nor the generator can be put in circuit.

Passing now to the features constituting the 25 first part of my invention—

In Fig. 1, S is an arm or stop pivoted upon the frame M of the motor-magnets B C and moving in a plane at right angles with that of the movement of the hook-lever H, on which 30 a receiver, W, is indicated as hanging. When the receiver is removed from its hook, the lever is thrown up by the spring  $z$ , in consequence of which the inclined stud O of the hook-lever (shown in Figs. 1 and 2) throws 35 forward the lower extremity of the arm S to rotate the latter on its pivot. This, as shown in Fig. 3, operates to cause the upper extremity of the arm or stop to intervene in the path of the pin P, (shown in Fig. 4,) inserted in the 40 anterior face of the ratchet-wheel G on the axis K of the index I.

The ratchet-wheel and pin are adjusted to each instrument with relation to the point at which the index in its movement over the dial- 45 rim R encounters the local shunt L.

The spring  $y$ , attached to the frame, throws the stop out of engagement with the pin whenever the hook-lever is depressed by the restoration of the receiver to its hook.

50 By the telephone-connection with the unison-shunt, on removing the receiver, a subscriber communicates his instructions to call another on the same line to the operator. The latter moves the index of the proper instrument upon its local shunt, and sounds the bell of the 55 person to be called. In so doing he moves all the other indexes in the line to a corresponding point on their dial-rims, except that of the first subscriber. The automatic operation of 60 the stop on the receiver, being removed from its hook, arrests this index in its passage over its local shunt. By their connections with the local shunts the telephones of these two instruments are put in circuit. The telephones, 65 generators, and bells of the other instruments on the line are cut out.

Instead of the arm or stop S being pivoted upon the frame M, as shown in Figs. 1 and 2, it may be fixed, as shown in Fig. 4, to the hook-lever, and of such a shape as to be thrown up 70 in the path of the pin P when the lever is raised on the removal of the receiver.

In the foregoing applications of my invention to the local-call instrument previously described the electrical connections are the 75 same as those set forth in Patent No. 265,454.

It is evident that a stop operated manually through the exterior case of the instrument may be made to intervene in the path of the 80 index; but this method has obvious objections which do not pertain to the automatic stops above described. A stop pivoted on the frame M and operated by the hook-lever may be also made to engage directly with the index, and various equivalents to effect the same 85 object as the preferred methods already given will suggest themselves to mechanical minds.

Among subscribers on the same line it will be seen that the improvement set forth above 90 secures secrecy of communication between particular persons by cutting out the telephones of the others, safety from interruption by cutting out the other generators, simplicity of construction by doing away with the need 95 for an extension of the unison-shunt or the establishment of a special conversation and signal shunt, and celerity of operation by dispensing with three maneuvers on the part of the central-office operator.

Another feature of my invention provides a 100 simplification of the electrical connections described above and shown in Patent No. 265,454. In place of the double connection of the telephone with the unison-shunt and local shunt in each instrument in the series, a single con- 105 nection with the local shunt is substituted. The connection between the unison-shunt and detent-magnet with the hook-lever and alternate connections with the switch-spring  $k'$  and the generator-frame and with the switch-spring 110  $s'$  and the telephone are dispensed with. The local shunt L connects with the contact-spring  $g'$  by the wire  $u$ . The switch-spring  $h'$  connects with the bell-magnet by the wire  $v$ , and the switch-spring  $i'$  connects with the tele- 115 phone.

When the receiver W hangs upon its hook and depresses the pivoted hook-lever H, the contact-spring  $g'$  rests upon the switch-spring 120  $h'$ . When the receiver is removed, the lever rises and throws up the spring  $g'$  against the switch-spring  $i'$ .

In place of the connection between the detent-magnet and the generator-frame by the wire  $r$ , hook-lever, switch-spring  $k'$ , and wire 125  $t$ , a direct connection by the wire  $r'$  is substituted.

The current comes in from the line  $m$  by way of the motor-magnets B C to the index I. If the index be on the unison-shunt U, (see 130 Fig. 6,) the current passes by the wire  $r$ , detent-magnet T, and wire  $r'$  to the generator,



and thence by the wire *t* to the line *o*. If the index be on the rim *R*, the current passes to the line *o* by the wire *p*, the generator, bell, and telephone being cut out. If the index be on the local shunt *L*, the current goes by the wire *u* to the contact-spring *g'*, and thence, when the receiver *W* is on its hook and the lever *H* is depressed, by the switch-spring *h'*, wire *v*, contact-spring *b*, bell-magnet *V*, and contact-spring *c* to the line *o*. When the receiver *W* is removed and the lever elevated, the contact between *g'* and *h'* is broken, and then the current goes by way of the switch-spring *i'* to the telephone, and thence by wire *q* to line *o*.

The operation of this form of my improvement is as follows: A subscriber, by the connection shown in Fig. 6 with the unison-shunt, when the index rests on the latter, puts the generator of his instrument in circuit, signals the central office, and removes the receiver from its hook. The operator, on receiving the call, moves the indexes of the other instruments on the line through one revolution, the subscriber's index being arrested on its local shunt and his telephone put in circuit. The subscriber then communicates his instructions to call another on the same line to the operator, who moves the index of the proper instrument upon its local shunt and sounds the bell of the person to be called. If the instructions are to call another person on a different line, he performs a like operation on the proper instrument on that line after moving the indexes on the first line from the unison-point. In either case by their connections with the local shunts the telephones of these two instruments are put in circuit. The telephones, bells, and generators of the other instruments on the same line or on the two lines are cut out.

While the device has been shown in its particular application to the instrument covered by the patents referred to, it will be seen that it may be adapted to various apparatus of a similar character, and that the invention is applicable to all instruments having the general mode of action above specified.

The present invention is restricted to those matters and things which are claimed herein, and as to all features, devices, or combinations which are shown or described, but not claimed, the right is reserved to make the same the subject of a separate application.

Having thus described the nature, construction, and operation of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a local-call instrument for telephonic purposes, an electrically-actuated switch connecting the telephone with the line, in combination with a stop for said switch, operated independently of the electric influence to maintain the switch in connection, substantially as described and shown, whereby connection between two instruments may be positively maintained at will.

2. In a local-call instrument for telephonic purposes, a rotary index whereby the instrument is placed in and out of circuit, and electrically-actuated devices, substantially as shown, for moving said index, combined with a stop mechanism, substantially as described, independent of the electric influence, to arrest the movement of the index and hold the same in electric connection, whereby the instrument may be maintained in circuit, notwithstanding the tendency of the electric current to move the index.

3. In a telephonic exchange system, a local-call instrument containing a revolving index, whereby the telephone is placed in and out of circuit, combined with a stop device for said index, and means, substantially as described, whereby the stop is thrown into and out of action by the removal or replacement of the receiving-instrument.

4. In a telephonic exchange system wherein a series of individual subscribers' call-instruments are connected with a central station, the combination, in such instrument, of a moving index electrically actuated from the central office, and serving to place the telephone in and out of circuit, a hook-lever whereby the receiving-instrument is thrown into and out of connection, and a stop device actuated by said lever to arrest the movement of the index, whereby the telephone may be positively retained in circuit.

5. In a telephonic exchange system, the combination, with the main line, of a series of local-call instruments, each instrument containing an electrically-actuated switch operating at a different time from like switches in the other instruments, to establish a connection with the main line, combined with a mechanical stop device therefor, substantially as described, whereby the switch in any of the series may be held mechanically and positively in connection, and thus the corresponding instrument maintained in circuit indefinitely.

6. In a telephonic exchange system, the combination, with the main line, of a series of local-call instruments, each embracing the following elements: the electrically-actuated main-line switch, closing at a different time from the like switches in the other instruments of the series, the local shunt, the telephone connecting with the main line solely by said switch and shunt, and the stop devices, substantially as described, for the main-line switch, operating independently of the stop device in the other instruments and of the electric influence, whereby either instrument of the series may be maintained in circuit at will.

7. In a local-call instrument for telephonic purposes, the electrically-actuated rotary index, whereby the instrument is placed in and out of circuit, combined with a manual stop device, substantially as described, to arrest the motion of said index and hold the instrument in circuit, whereby communication between two parties may be maintained at will.

8. In a telephone local-call instrument, a



movable switch in the line-circuit, a local-station shunt, a contact-spring,  $g'$ , in connection with said shunt, combined with a pivoted lever whereon the receiver may be hung, a switch-spring,  $i'$ , and a stop device to arrest the motion of the main-line switch at a given point, substantially as described, whereby the telephone may be maintained in circuit through the medium of a single connection at will.

10 9. In a local-call instrument such as described, the combination of the unison-shunt, wire  $r$ , detent-magnet  $T$ , and wire  $r'$ , leading directly from said magnet to the generator.

10. In a telephonic exchange system, the

combination, with the main line, of a series of 15 local-call instruments containing synchronously-operating switches connecting the same with the main line, combined with stop devices for said switches, located one in each instrument, and arranged as described, to operate 20 independent of the electric influence, whereby either instrument may be held in circuit independently of the action of the others.

WILLIAM NICHOLS.

Witnesses:

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