998,043.

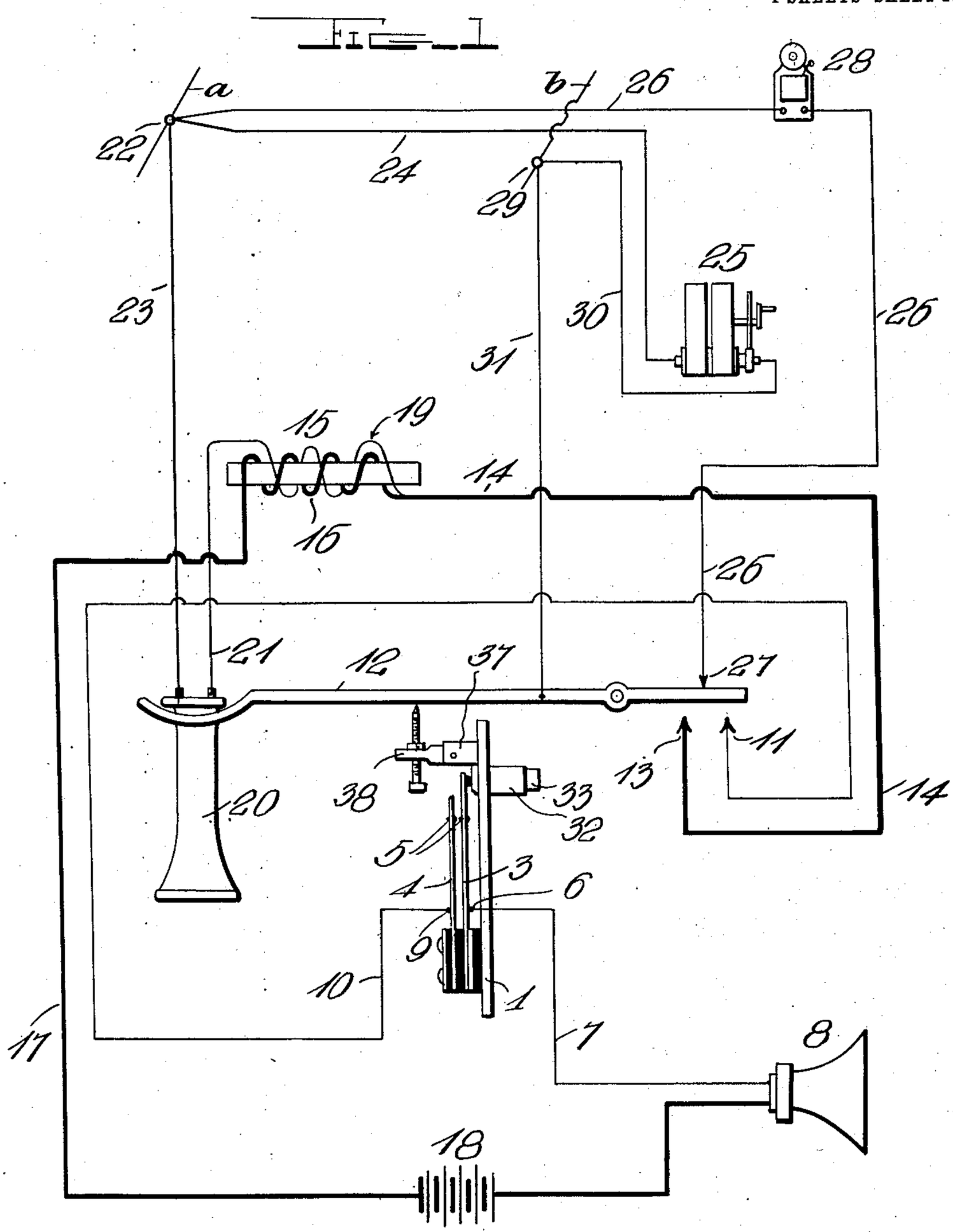
R. C. SMITH.

TELEPHONE SYSTEM.

APPLICATION FILED OCT. 26, 1910.

Patented July 18, 1911.

4 SHEETS—SHEET 1.



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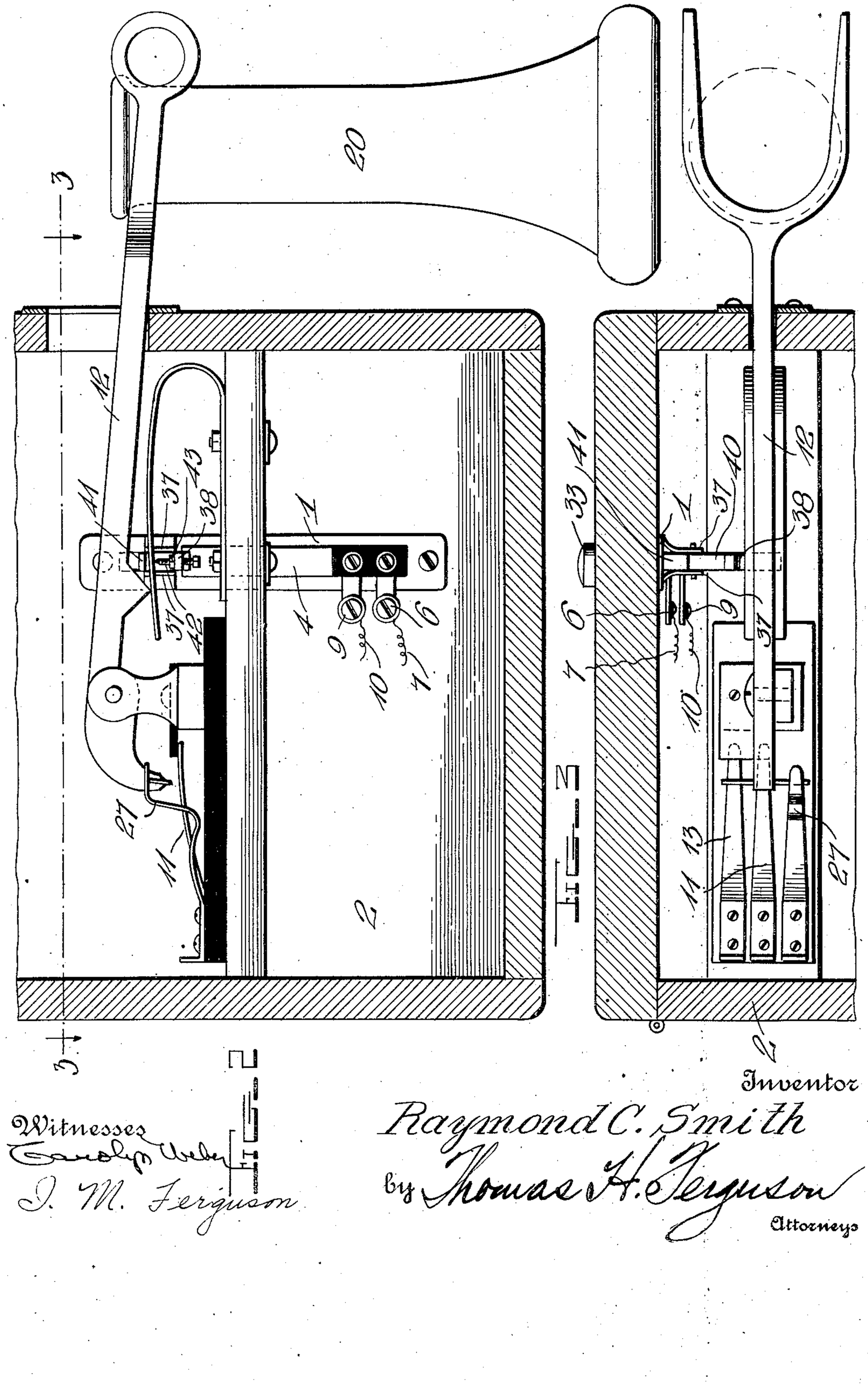
4 SHEETS—SHEET 2.



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4 SHEETS—SHEET 3.

Fig. 4

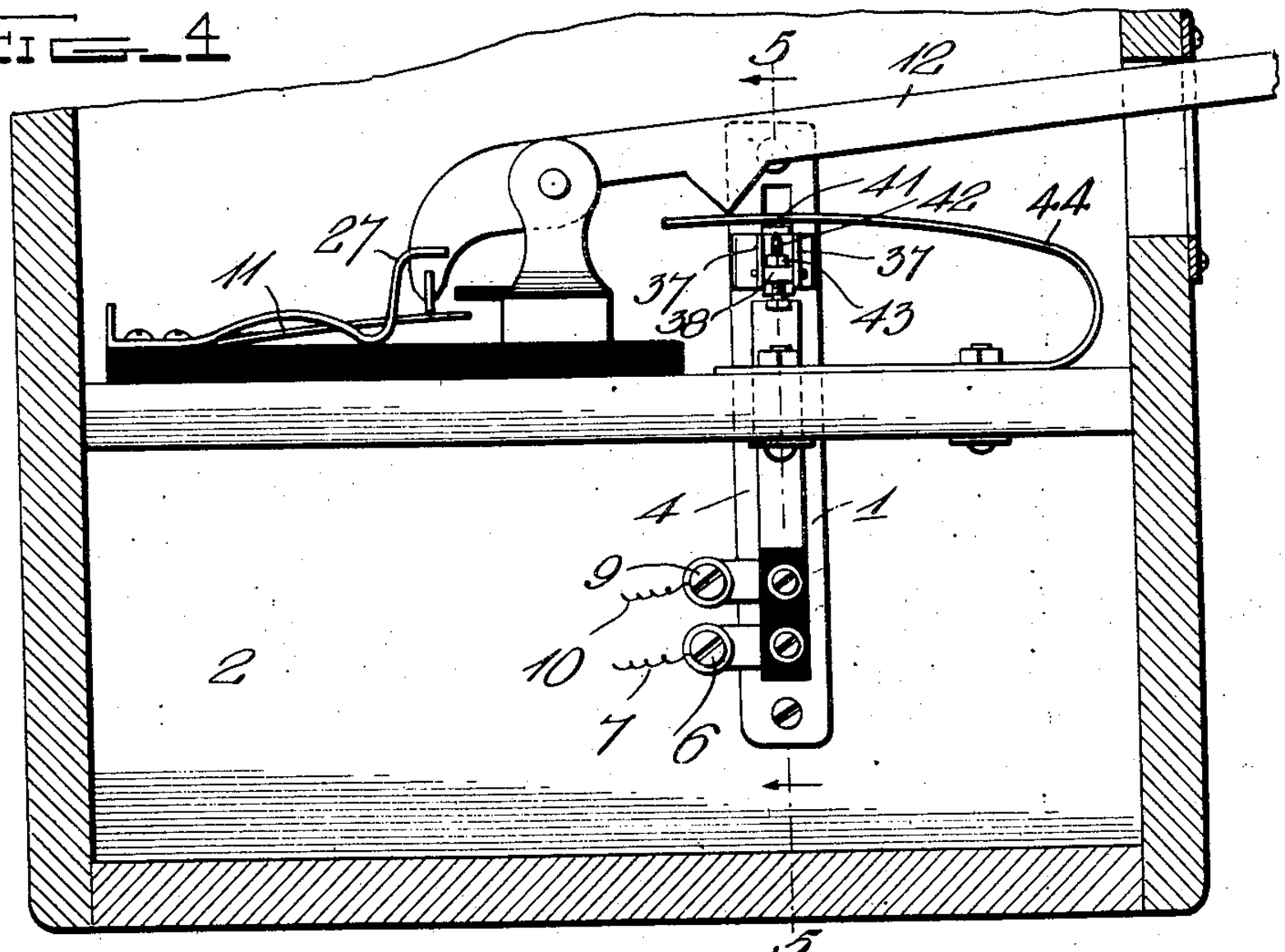


Fig. 5

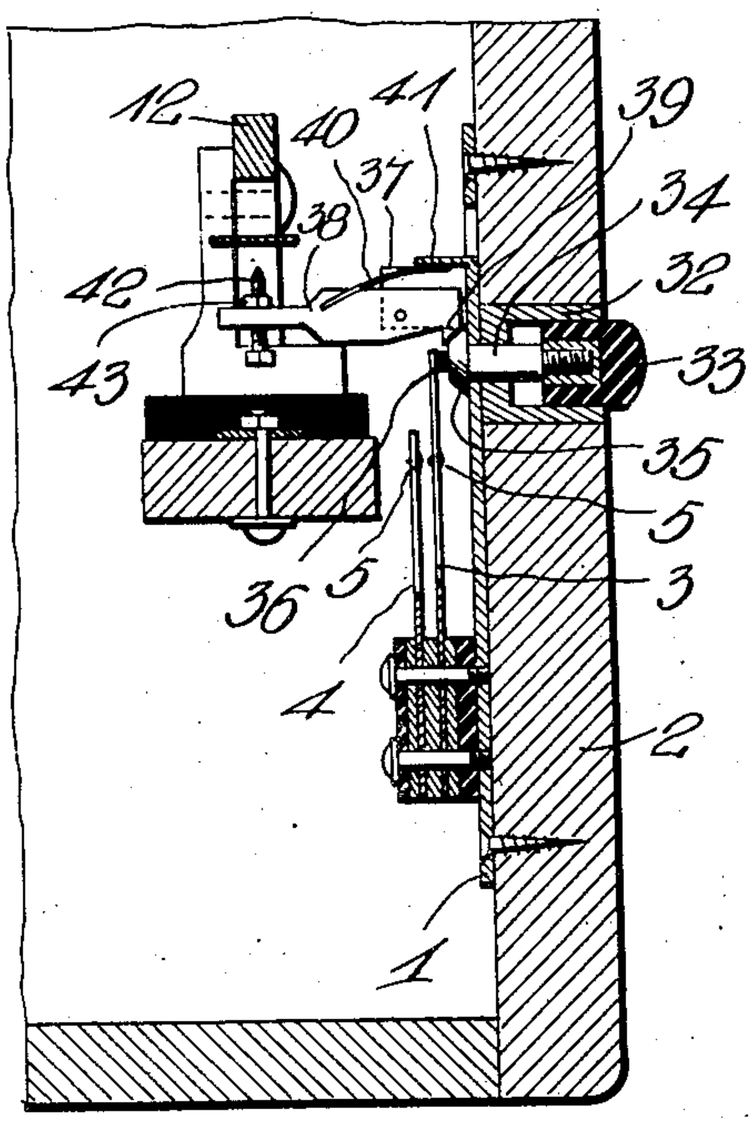
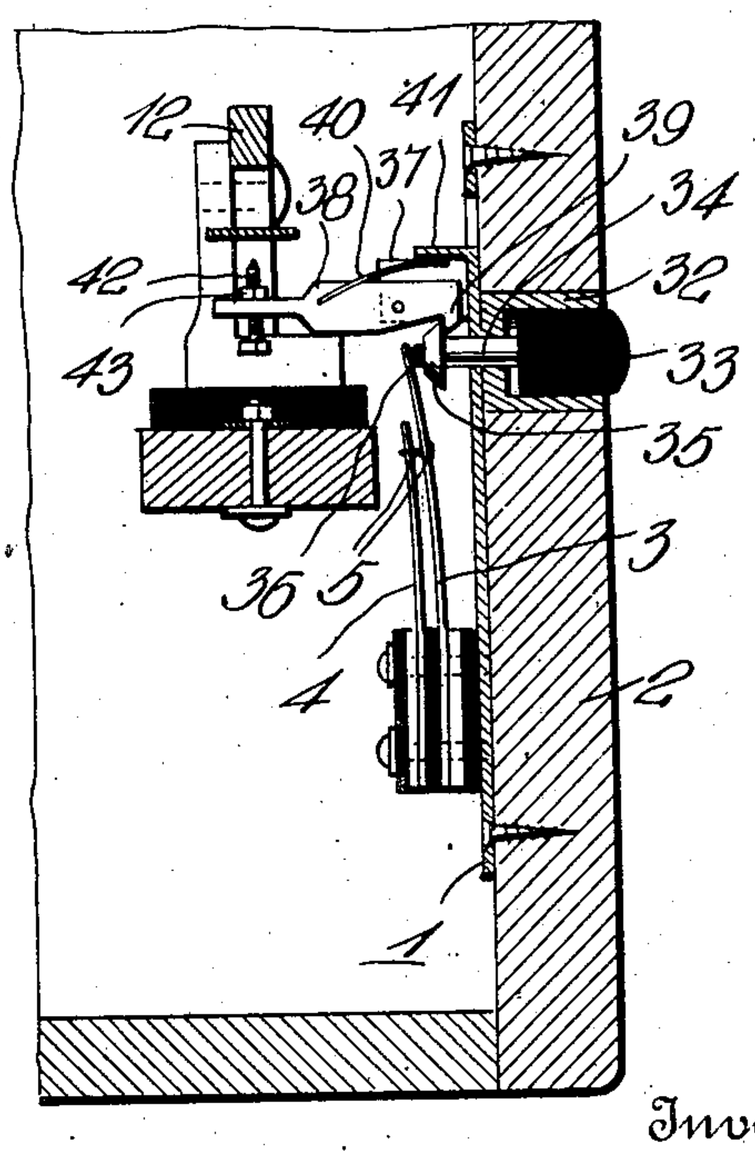


Fig. 6



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4 SHEETS—SHEET 4.

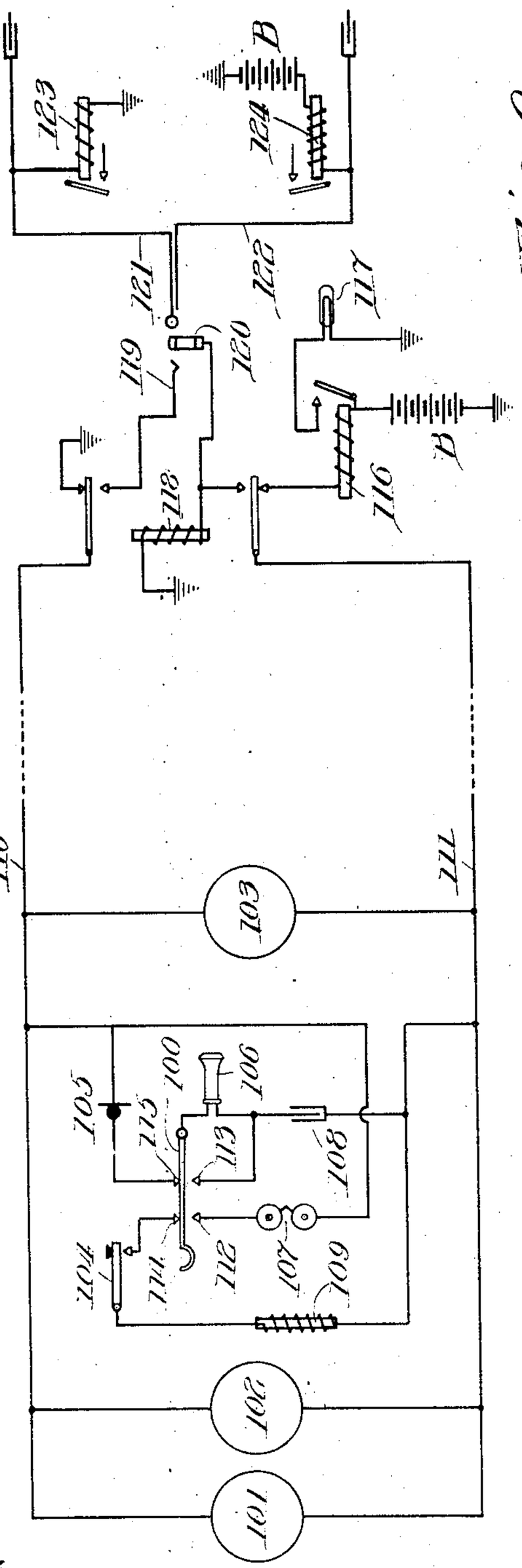

Fig. 7.

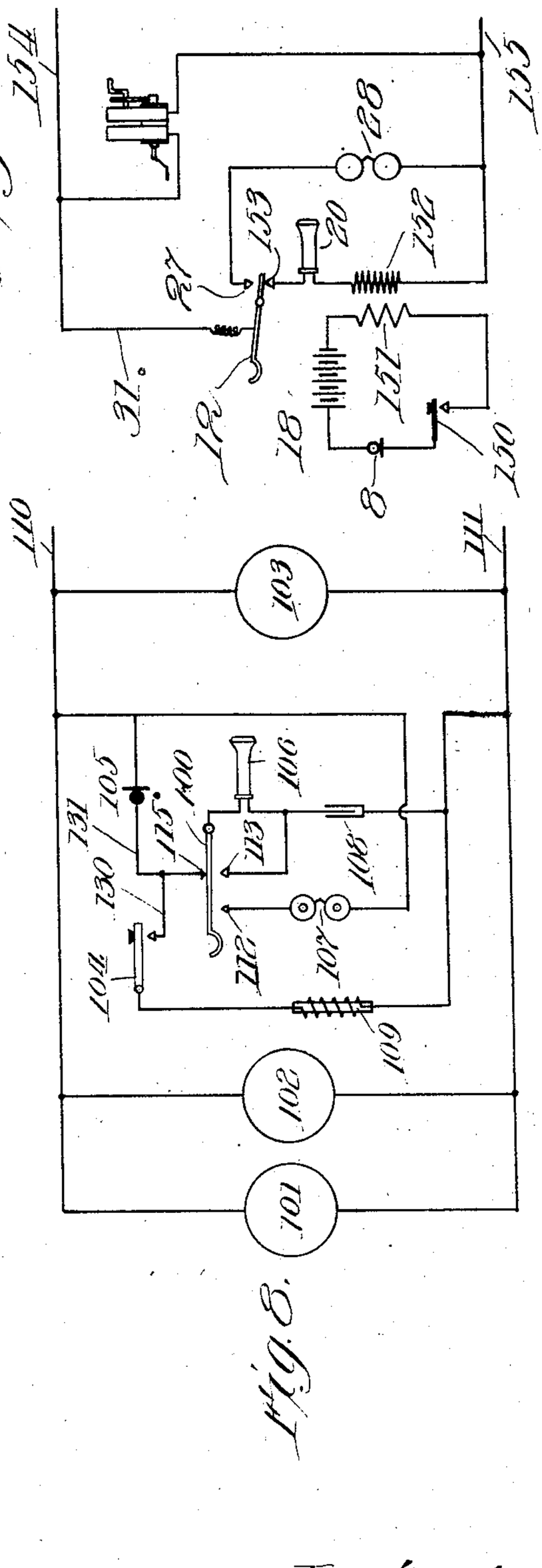

Fig. 8.

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UNITED STATES PATENT OFFICE.

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TELEPHONE SYSTEM.

998,043. Specification of Letters Patent. Patented July 18, 1911.

Application filed October 26, 1910. Serial No. 589,213.

To all whom it may concern:

Be it known that I, RAYMOND C. SMITH, a citizen of the United States, and resident of Homer, county of Calhoun, State of Michigan, have invented certain new and useful Improvements in Telephone Systems, of which the following is a specification.

The present invention relates to telephone systems generally and more particularly to the substation circuits and apparatus of such systems.

The object of the invention is to provide an arrangement of circuits and apparatus such that a subscriber may listen into his telephone line without bringing his transmitter into circuit with its energizing battery. This arrangement is capable of varied use, but is particularly applicable to use in so-called party lines, wherein a subscriber, wishing to make a call, may listen into the circuit to determine whether the line is busy or idle, and, if he finds it idle, then bring his transmitter and its energizing battery into operative relation with the circuit.

In carrying out my invention, I employ a manual switch of novel construction, which controls the energizing circuit of the transmitter in conjunction with the contacts of the usual switchhook. The removal of the receiver from its hook brings it into circuit with the line and a subsequent operation of the manual switch completes the battery circuit for the transmitter and such circuit is maintained until interrupted by the restoration of the receiver to its hook.

For a full understanding of the invention, attention is directed to the following detailed description, taken in connection with the accompanying drawings, while the scope of the invention will be particularly pointed out in the appended claims.

In said drawings, Figure 1 is a diagram of a local battery substation circuit constructed and arranged according to my invention; Fig. 2 is a vertical section, through the telephone-box, of a particular embodiment of the circuits and apparatus illustrated diagrammatically in Fig. 1, the figure illustrating the parts with the receiver upon its hook; Fig. 3 is a horizontal section taken on a plane indicated by the line 3—3 of Fig. 2; Fig. 4 is a view similar to Fig. 2, illustrating the position of the parts when the receiver is off its hook; Fig. 5 is a vertical section taken on a plane indicated by the line 5—5 of Fig. 4, showing the position of the parts with the receiver off its hook and the manual switch in normal position; Fig. 6 is a similar view illustrating the parts, with the manual switch in closed position; Figs. 7 and 8 are diagrams of a circuit illustrating my invention applied to a common battery system; and Fig. 9 is a diagram of a modified local battery circuit embodying my invention.

In that embodiment of the invention illustrated in Fig. 1, I employ the usual transmitter 8, receiver 20, switch-hook 12, induction coil 15, call-bell 28, ringing generator 25 and battery 18. The generator 25 is in permanent bridge of the line limbs *a*, *b*. The call-bell 28 is in a normally closed bridge adapted to be open at contact 27 of the switch-hook 12. The receiver 20 and the secondary winding 19 of the induction coil 15 are in a normally open bridge adapted to be closed at contact 13 when the receiver is removed from its hook. And the transmitter 8 is in a local circuit with the battery 18 and the primary winding 16 of the induction coil 15. This circuit is normally open at switch-hook contact 13 and the contact springs 3, 4, of the manual switch. This circuit is closed by the removal of the receiver from its hook, followed by the closing of the manual switch.

Referring more particularly to the construction of the various parts and their mechanical and electrical relation as illustrated in Figs. 1 to 6, inclusive, it will be observed that the manual switch comprises a supporting-plate 1, which is adapted to be secured at any suitable point to the telephone-box 2, as; for example, to the inner side of the door of the box. The base-plate 1 carries the contact springs 3 and 4, which are suitably insulated from each other and from the base. These springs have the usual platinum contact points 5. The inner spring 3 is longer than the outer spring 4 and projects slightly beyond the same, as illustrated. The terminal screw 6 of the contact spring 3 is electrically connected by wire 7 to the transmitter 8. The terminal screw 9 of contact spring 4 is similarly connected by wire 10 to the spring contact 11 of the switch-hook 12. Spring contact 13 of the switch-hook is connected by wire 14 with the primary winding 16 and secondary winding 19 of induction coil 15. Wire 17 connects the other end of the primary winding 16 to one pole of the battery 18, while wire 21 con-

nects the other end of the secondary winding 19 to one terminal of the receiver 20. A wire 23 connects the other terminal of the receiver to the line limb *a* at point 22. The wires 24 and 30 connect the generator 25 between the line terminals 22 and 29. Wire 26 similarly connects the call-bell 28 between the line terminal 22 and switchhook contact 27. The latter, in turn, is connected to the line terminal 29 by wire 31.

In the manual switch, the plate 1 is provided with a push-button socket 32 which projects through the door of the telephone-box and contains the push-button 33, which has a screw-threaded engagement at its inner end with a spring-projected plunger 34, which, in turn, is slidably mounted in the push-button socket 32 and projects through the base 1 of the switch. A beveled head 35 is located on the inner end of the plunger 34 and is provided with a contact stud 36 formed of any suitable non-conducting material. The upper end of the plate 1 is provided with inwardly projecting lugs 37 between which a catch-bar 38 is pivotally mounted. This catch-bar has a beveled catch-lug near its lower edge, which is adapted to coöperate with the beveled head 35 of the push-button plunger 34. A leaf-spring 40 is fixed at one end to the catch-bar 38, and at its other end bears against the lug 41 formed upon the plate 1. This spring normally presses the catch-lug 39 into position to engage and hold the manual switch in closed position after it has been operated by pressing the push-button 33. The inner end of the catch-bar 38 extends beneath the switchhook 12 and is provided with an adjusting screw 42, which is adapted to be screwed through the bar any suitable distance and there retained by a jam-nut 43.

In arranging the manual switch in the telephone-box it is located so that the inner end of the catch-bar 38 will be actuated upon the movement of the switch-hook. As illustrated, when the switchhook is depressed, spring 44, which is directly actuated thereby, will engage screw 42 and force the inner end of the catch-bar downward against the tension of its spring, thereby moving the catch-lug 38 out of operative position and, if it has been in locking engagement with the head 35, releasing the push-button and allowing it and its control springs 3 and 4 to return to normal, the spring 3 serving as a restoring spring to the push-button.

As previously stated, the circuit here disclosed is particularly applicable to party lines. When so used, a party, desiring to make a call, or, for some other reason, wishing to know whether or not his line is in use, removes his receiver from its hook and thereby connects his receiver 20 in bridge of the line via conductors 23, 21, 14 and 31, but without completing the circuit through his transmitter 8. If, upon thus listening into the line, he finds it idle and wishes to converse with the operator who has answered the call, or with some other party, he depresses the push-button 33 of his manual switch and thereby completes the energizing circuit for his transmitter 8 by including it in circuit with the battery 18, the completed circuit including conductors 7, 10, 14 and 17. Inasmuch as the receiver is off its hook at this time, the catch-bar 38 will be free to operate to retain the manual switch in its closed position. The parts will remain in this condition until the receiver is restored to its hook, whereupon the latch will be tripped and the parts restored to normal.

In addition to the application of the invention to local battery circuits, it will be apparent that the same is equally applicable to common battery circuits. I have accordingly illustrated in Fig. 7 an application of my invention to a well known Kellogg common battery circuit. In this figure, four substations are illustrated, three by the circles 101, 102, 103, and the fourth by the substation circuits in detail. In these latter, the manual switch of Figs. 1–6 is shown diagrammatically at 104, while the usual transmitter 105, receiver 106, call-bell 107, condenser 108, impedance coil 109 and switchhook 100 are provided. Normally, the call-bell 107 and condenser 108 are in bridge of the line limbs 110 and 111. Upon the removal of the receiver from its hook, this normal bridge through the call-bell is interrupted at contacts 112, 113, and the transmitter 105, receiver 106 and condenser 108 are brought into bridge by the closing of switchhook contact 114. This provides a listening circuit by which the subscriber may determine whether his line is in use or not. It will be observed that prior to the actuation of the manual switch 104, current will not be supplied from the main battery B at the central office to the transmitter 105 because of the presence of the condenser 108 in the circuit. However, as soon as switch 104 is closed, the transmitter 105 will be energized by current flowing over the line and through the path in shunt to the condenser and receiver, which includes impedance coil 109, closed switch 104, contacts 115, 114, and transmitter 105. From this it is also apparent that a party, desiring to listen into the line, may do so without having his transmitter supplied with energizing current. In this application of my invention to a common battery system, I have shown the usual Kellogg line and cord circuits, as well as the modified substation circuit. This circuit is well known, being described in many patents and in the publication, "*American Telephone Practice*," by Kempster B. Miller, fourth edition, McGraw Publishing Company, 114

Liberty street, New York, at pages 322, 323 and 368, and need not be described in detail. It will suffice to state that 116 is the line relay which controls the line lamp 117, and relay 118 is the usual cut-off relay by which the normal control of the line relay is interrupted and the line limbs are extended to the jack contacts 119, 120. This line circuit coöperates with the usual cord-circuit having the tip strand 121, sleeve strand 122, and tip supervisory relays 123, 124, respectively, which are included with the battery B in bridge of the strands.

In Fig. 8, I have illustrated substantially the same circuits as in Fig. 7 and I have used the same reference characters as in that figure. The only way in which the circuits of Fig. 8 differ from those of Fig. 7 is in connecting the fixed contact of the switch 104 by conductor 130 to conductor 131, instead of to contact 114, as in Fig. 7. This leaves the operation of the circuits of Fig. 8 substantially the same as that of the circuits of Fig. 7, which have been described above. In Fig. 8, the transmitter current passes through conductors 130 and 131 instead of through contacts 114 and 115 and switch-hook 100, as in Fig. 7. This is advantageous in removing a contact from the circuit through the battery and transmitter.

In Fig. 9, I have illustrated a modification of the circuit arrangement of Fig. 1, in which one of the switch-hook contacts of that figure is eliminated. In this modification, the generator 25 is bridged across the line limbs 154 and 155, and the call-bell 28 is connected between limb 155 and the normally closed contact 27 of the switch-hook 12 just as in Fig. 1. The switch-hook is also electrically connected by conductor 31 with line limb 154. The transmitter 8, battery 18, the manual switch, here designated 150, and the primary winding of the induction coil, here designated 151, are in a normally open local circuit. This circuit is controlled by the manual switch just as in Fig. 1. The secondary winding 152 of the induction coil is connected in series with the receiver 20 between the normally open contact 153—which replaces contacts 11 and 13 of Fig. 1—and line limb 155. The operation and uses of the circuit are the same, substantially, as that of the circuit of Fig. 1 and therefore need not be explained in detail. The generator and call-bell are in normally closed bridges so that either may be operated to transmit or receive signals. The receiver is in a normally open bridge which may be closed by removing it from its switch-hook. The transmitter and battery are in a local circuit which is not affected by the removal of the receiver from its hook. Thus the subscriber may readily listen into the line and determine its condition without wasting battery energy, and then, if he wishes to talk, may actuate his manual switch to close the local circuit, which will then remain closed until the receiver is restored to its hook at the end of the conversation.

It is obvious that my invention is capable of other applications than those herein given and that the same may be considerably modified in detail without departing from its scope and spirit. I, therefore, do not wish to be limited to the specific embodiments and details herein disclosed, but aim to cover all such variations in use and modifications in arrangement and structure by the terms of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is:—

1. A telephone system including a telephone line, a battery and transmitter in normally open circuit of said line, a receiver in normally open circuit of said line, a switch-hook for closing only the normally open circuit of said receiver upon its removal from said hook, a manual switch for closing the normally open circuit through said battery and transmitter, and means for subsequently actuating said manual switch to open said circuit in response to the restoration of the receiver to its hook.

2. A telephone system including a telephone line, a transmitter, a receiver, a battery, connections for bringing said receiver into circuit with said line, other connections for completing an energizing circuit from said battery to said transmitter, a manual switch having contacts included in said latter circuit, controlling means for said switch movable independently of said switch, and a switch-hook for varying said connections and actuating said controlling means.

3. A telephone system including a telephone line, a transmitter, a receiver, a battery, connections for bringing said receiver into circuit with said line, other connections for completing an energizing circuit from said battery to said transmitter, a manual switch having contacts in said latter circuit, catch mechanism for said switch movable independently of said switch, and a switch-hook for varying said connections and actuating said catch mechanism.

4. A telephone system including a transmitter, a receiver, a battery, a manual switch having contacts included in circuit with said battery and transmitter, a spring-pressed catch operative, when free, to hold said switch in actuated position, and a switch-hook for varying the circuit connections and operative, when in one position, to leave said catch free to operate and, when in another position, to throw said catch out of operative relation with said switch.

5. A telephone system including a transmitter, a receiver, a battery, a switchhook, a manual switch having a base-plate, contact springs secured to and insulated from each

other and said base-plate and included in circuit with said battery and transmitter, a switch-closing plunger slidably mounted in said plate, a push-button connected with said plunger and operative to cause the latter to close circuit through said contact springs, a beveled head on said plunger, a pivoted spring-pressed catch having at one end a beveled catch-lug for engaging said head to hold the plunger in its depressed position, and having at the other end an arm lying in the path of movement of said switchhook, whereby the latter, when depressed, throws said beveled catch-lug out of operative position and, when elevated, allows it to move into operative position.

In witness whereof, I hereunto subscribe my name this 22nd day of October, 1910.

RAYMOND C. SMITH.

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