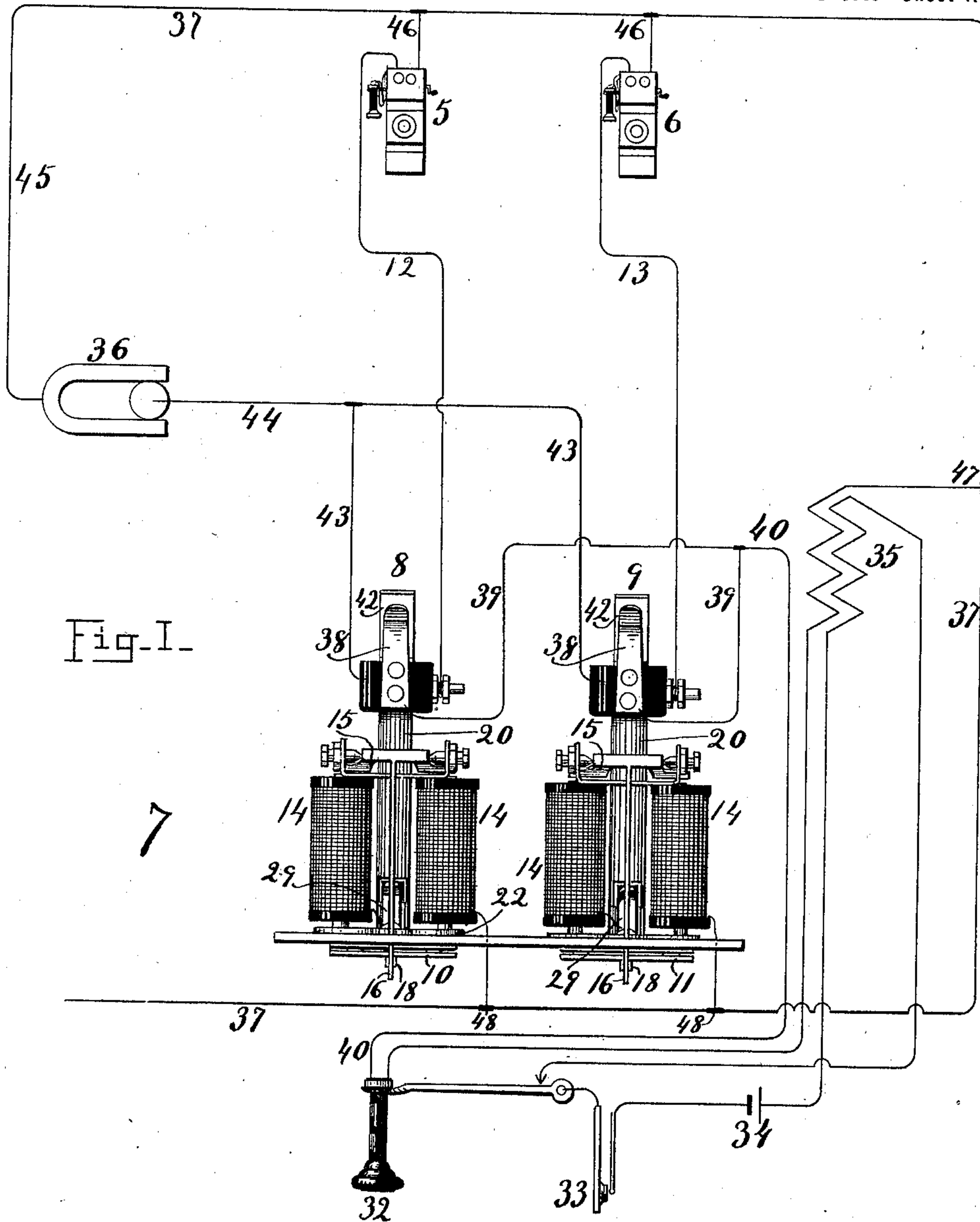


C. E. EGAN, B. L. LAWTON & E. C. WILCOX.  
TELEPHONE SYSTEM.

(Application filed Apr. 9, 1897.)

2 Sheets—Sheet 1.



Witnesses  
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No. 609,229.

Patented Aug. 16, 1898.

C. E. EGAN, B. L. LAWTON & E. C. WILCOX.

TELEPHONE SYSTEM.

(Application filed Apr. 9, 1897.)

(No Model.)

2 Sheets—Sheet 2.

Fig. II.

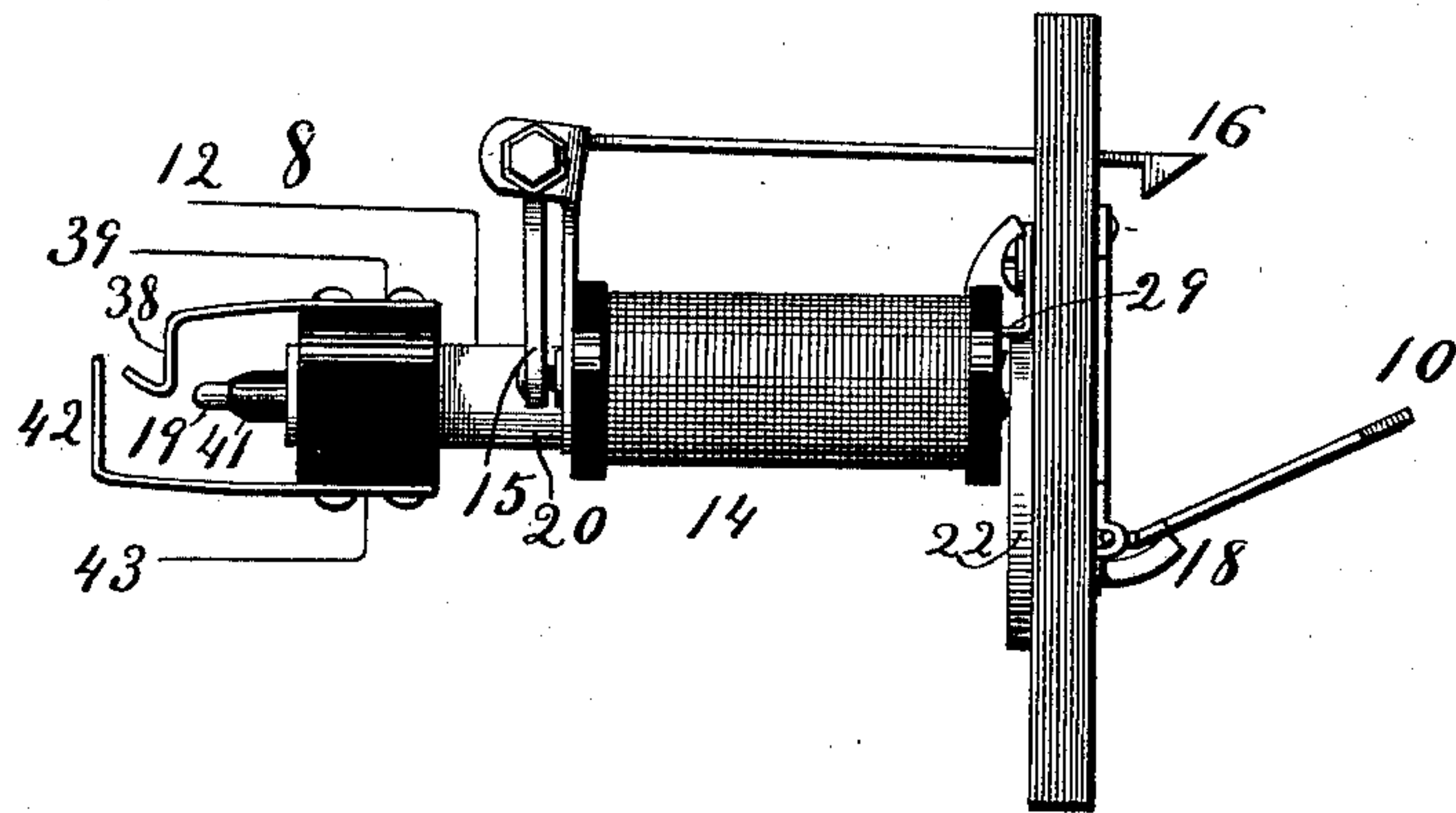


Fig. III.

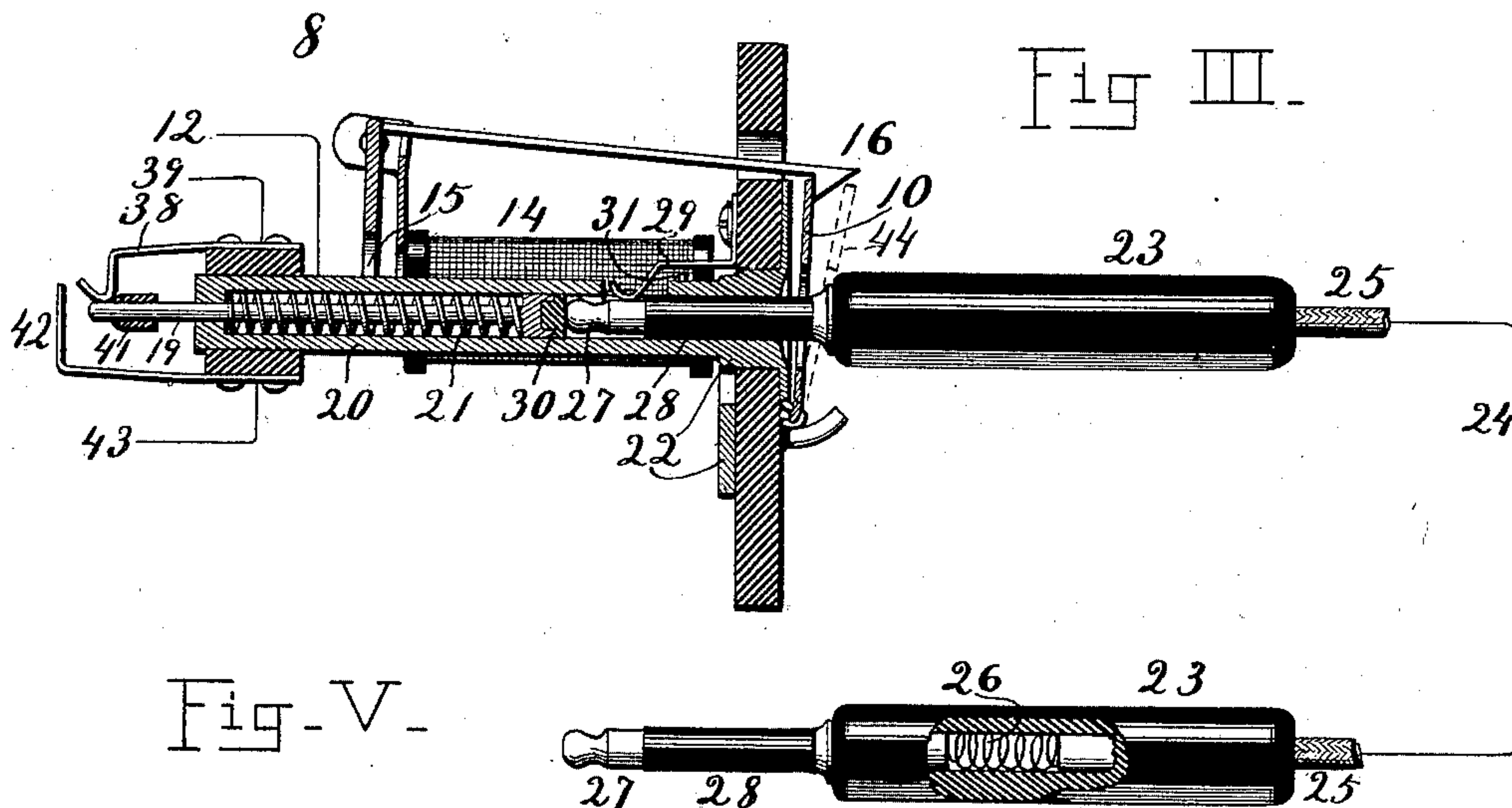


Fig. V.

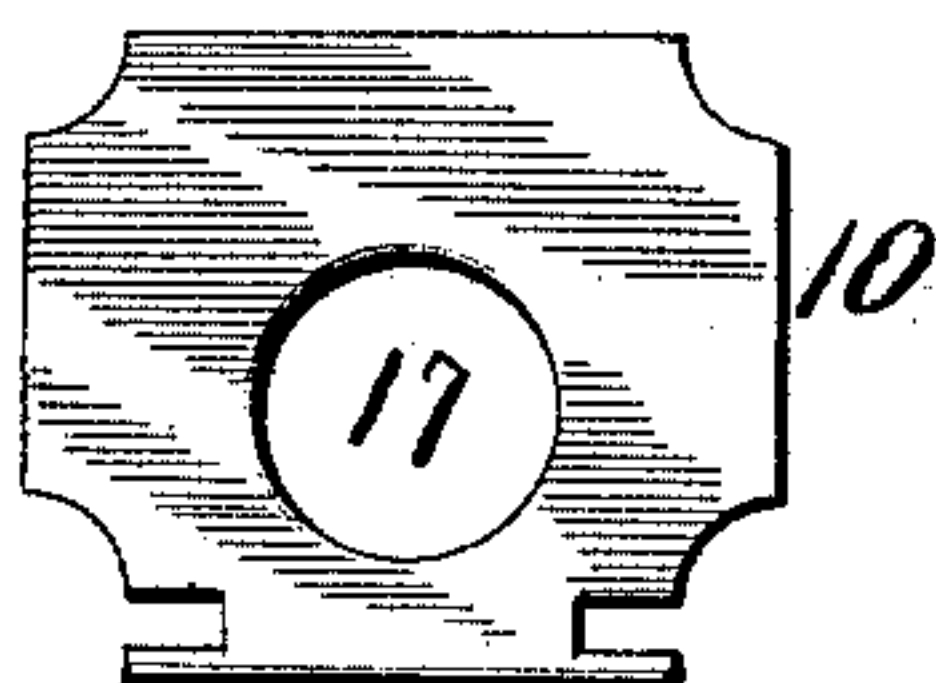
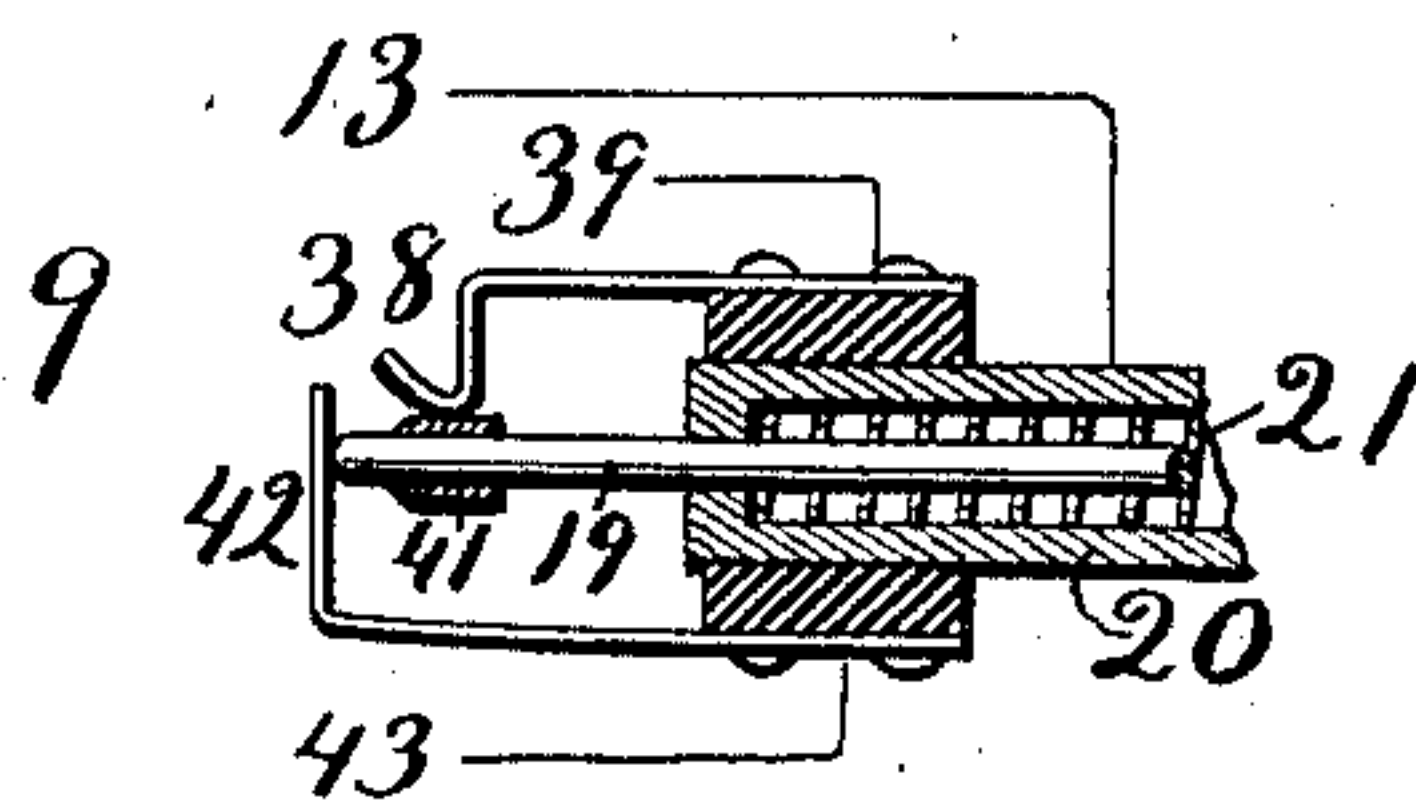


Fig. IV.



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# UNITED STATES PATENT OFFICE.

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MERIDEN, CONNECTICUT.

## TELEPHONE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 609,229, dated August 16, 1898.

Application filed April 9, 1897. Serial No. 631,346. (No model.)

*To all whom it may concern:*

Be it known that we, CHARLES E. EGAN, BURTON L. LAWTON, and ERNEST C. WILCOX, citizens of the United States, residing at Meriden, in the county of New Haven and State of Connecticut, have invented a new and useful Improvement in Telephone Systems; and we do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, in which—

Figure I is a diagram of a telephone system, including two spring-jacks and an operator's telephone at a central station, according to our invention. Fig. II is a side elevation of a spring-jack and drop with the drop-shutter down, as when a call to central is made by a subscriber. Fig. III is a longitudinal section, partly in side elevation, of a spring-jack, a drop, and a pair of switch-plugs in position for central to talk with the caller. Fig. IV is a side elevation of a portion of a spring-jack in position for central to ring up the subscriber called for. Fig. V is a face view of a drop-shutter.

This invention relates to that class of telephone systems known as "the ground or common return" system; and its object is to facilitate rapidity of operation and to economize space in the switchboards of central stations.

To this end our invention consists in the construction, combination, and arrangement of parts forming a "telephone system," hereinafter more fully described, and particularly pointed out in the claims.

For the purposes of this application it is deemed necessary to show only the telephones and their connections of two subscribers in a system.

5 represents the telephone of the calling subscriber, 6 the telephone of the subscriber called, and 7 a switchboard at the central station provided with a series of spring-jacks 8 9 and drop-shutters 10 11. These jacks are connected, respectively, with the telephones 5 and 6 by wires 12 and 13. Each spring-jack is provided with two magnet-coils 14, the

winding of one of which coils is connected with a switch-spring 29 and the other running to the ground at 48. The armature 15 of the spring-jack is provided with a hook 16, hung to normally engage the drop-shutters 10 and 11 and hold them closed, as shown in Fig. II. The shutters are pivoted at their lower edges, so as to drop by gravity when their respective hooks are raised by agitation of their armatures. The shutter herein shown has a central aperture 17, through which a switch-plug 23 must be inserted to operate the spring-jack. When the shutter is open, it rests upon the stop-pin 18, inclined forward, as shown in Fig. I, so that the switch-plug must be placed under the shutter and raise it in the act of inserting the plug into the spring-jack, and at the same time the operator's finger may close or reset the shutter; but the aperture in this shutter is of such proportions and location that the shutter may again drop forward, as shown in dotted lines 4 4, while the plug still remains inserted in the spring-jack, so that if either subscriber rings off his shutter thus drops onto the switch-plug, whereby notice is given to the central operator without the aid of any separate clearing-out device on the switchboard, and the shutter may be reset by the operator's finger extending forward a little as he withdraws the plug.

19 is a plunger fitted to slide freely in the body 20 of the spring-jack and provided with a spring 21, which acts to withdraw the plunger into the body and to so hold it normally, as shown in Fig. II. The plunger is always in metallic contact with the body 20, and the body is integral with or permanently secured to its metallic supporting-frame 22. The switch-plugs 23 are connected in pairs by a wire 24, which is surrounded with insulating-cord 25 in any usual manner, but we install a resistance of two or three hundred ohms somewhere in the circuit of this connecting-wire 24, preferably in the handles of the plugs, as indicated by the coil 26, which is intended to represent a resistance-coil. The metallic nib 27 of the plug is a little smaller than the plug-neck 28, which latter is of insulating



material, for the purpose of keeping the plug from metallic contact with the body 20 of the spring-jack.

The plunger 19 has a cap 30 at its inner end of insulating material to avoid metallic contact with the plug-nib 27.

29 is a spring insulated at its base, but connected with the winding of one of the coils 14, while its free end projects through an aperture in the side of the body 20 into the path of the switch-plug.

31 is a stud of the metallic body 20, upon which the spring 29 normally rests, keeping the magnet-coils of the drop in circuit with the body 20 when the switch-plug is not in the jack. Contact between spring 29 and stud 31 is also permitted when the plug is in the jack only far enough for the spring 29 to engage the neck of nib 27, but is broken when the plug is pushed in far enough to engage the plunger 19 with either of the switch-springs 38 or 42.

32 is the central-operator's receiver, and 33 her transmitter.

34 represents a battery, 35 an induction-coil, 36 a magneto-generator, and 37 a ground or common return line.

38 is a spring of each spring-jack, connected by a branch wire 39 with a wire 40, that leads to the operator's receiver 32.

42 is a spring of each spring-jack, connected by a branch wire 43 with the wire 44, that comes from the magneto-generator 36.

45 is a ground or return wire for the generator. Connections are also shown with the ground or return line 37 at 46, 47, and 48 of the subscriber's telephone, the central-operator's receiver, and one coil of each of the central spring-jacks, respectively. On its way to the ground the wire 47 passes from the operator's receiver 32 through the induction-coil 35.

The operation is as follows: When subscriber 5 sends in a call, it comes through wire 12, body 20, stud 31, and spring 29 into one of the coils 14, and on its way through the other coil 14 to the ground at 48 it vitalizes the coil-magnet, and the armature 15 of spring-jack 8 will be agitated, permitting the shutter 10 to drop. The central operator noticing the call takes a plug 23 of any pair of switch-plugs that are free at hand and thrusts it through shutter 10, and, projecting her finger, she resets that shutter, then pushes the plug into spring-jack 8 far enough to slide the plunger 19 into contact with switch-spring 38, which connects the central telephone 32 33 with the calling subscriber 5. Then the circuit coming in through line 12 to the spring-jack 8 is switched from the plunger 19 by spring 38 and wire 39 and 40 and conducted to the said central telephone 32 33, when the operator may talk with subscriber 5. Being told that 6 is the subscriber called for the operator releases the plug in spring-jack 8, permitting the spring 21 to withdraw plunger 19

from contact with spring 38, thus breaking that circuit and leaving the plug-nib 27 in contact with spring 29 and this spring 29 also in contact with the stud 31. Then the operator takes the other plug of the pair and inserts it in spring-jack 9, pushing it in until the plunger 19 is in contact with the spring 42, by which connection a current is introduced through the wires 43 and 44 from the generator 36, and, passing through plunger 19, frame 20, and wire 13, the bell of subscriber 6 is rung. At this time an insulating collar or projection 41 on the plunger 19 is interposed and holds spring 38 out of contact with the plunger, as shown in Fig. IV, so that the current will not go back through the operator's phone. The switch-plug being at the same time insulated by the spring 29 resting on the neck 28, the current cannot go back through the switch-cord to the first subscriber. Now the operator permits the plunger and plug of jack 9 to be withdrawn by its spring 21, and the two plugs are left in contact with the respective springs 29 while the subscribers use the line, and when either subscriber rings off the current comes in as before described in the call made to central by subscriber No. 5, and when that magnet is energized his drop-shutter will fall forward onto the inserted plug. Then both plugs may be withdrawn and the shutter reset. The coils 14 of both drops being connected with the talking-circuit through the studs 31, with which the springs 29 are in contact, the free ends of the springs resting in the necks of the nibs 27, the ringing off by either subscriber would naturally drop both shutters, but the resistance 26, installed in the circuit of the two plugs, permits either subscriber to ring off and drop his own shutter while it stops enough of the current to prevent dropping the shutter at the other plug, which is in circuit beyond the resistance. Let us suppose that subscriber 6 rings off. The current comes in on wire 13 to body 20, and, meeting with partial resistance in coil 26, its main force is deflected through the coils 14 in spring-jack 9, whereby the shutter 11 is dropped onto the plug and the circuit is completed over the common return-wire 37 to phone 6. The resistance 26 deflects so much of the current generated by hand at the phone-crank that not enough will pass into the coils 14 of jack No. 8 to drop the shutter 10, and that part of the current so deflected being nearly all expended in energizing the coils 14 of jack No. 9 there is not sufficient strength left in the current when it reaches the common return-wire 37 to operate another drop, even if that drop were in the path of least resistance, which it is not. The path of least resistance is over the common return-wire 37, as before pointed out. This ring-off drop could not be operated without the resistance-coil 26. In the absence of that resistance a ring-off current would have open circuit



through the bodies of both jacks and the switch, and would never seek the path of greater resistance through either of the drop-coils. The shutters thus arranged to drop while the plugs remain inserted serve the purpose of clearing out drops without requiring any special drops or connections for that purpose, thus materially simplifying the construction and operation of the switchboard and reducing the cost. This resistance may be located in one or both plugs of a pair or anywhere in the connecting-cord. The springs 29, through which the regular communications pass between subscribers, may be herein called "subscriber's communicating springs."

Having thus fully described our invention, what we believe to be new, and desire to secure by Letters Patent, is the following:

1. In telephone systems, a spring-jack comprising a metallic frame, a drop-shutter, magnet-coils, a magnet-armature provided with a drop-shutter-retaining hook, a metallic plunger fitted to reciprocate in the frame and having a retracting-spring, a slideway for a switch-plug in the frame in line of the said plunger, a spring projecting into the slideway and connected with the winding of one of the magnet-coils, and the other coil having ground or common return line connection, and means for connecting a subscriber's line with the said frame, substantially as described.

2. In telephone systems, metallic spring-jack frames having each a slideway to receive a switch-plug; a metallic plunger fitted to reciprocate in contact with each frame in line of the said slideway, and a return-spring for each plunger; line-connecting springs located with their free ends projecting into the paths of the said plungers, respectively; switch-plugs connected in pairs and having metallic ends fitted to engage the said plungers; caps of insulating material for the rear ends of the plungers, and springs adapted to engage the said plugs, respectively, with the spring-jack coil, substantially as described.

3. In telephone systems, metallic spring-jack frames having each a slideway to receive a switch-plug; a metallic plunger fitted to reciprocate in contact with each frame, in line of the said slideway, and a return-spring for each plunger; a spring for connecting the central telephone-wire with each spring-jack, the free end of the said spring projecting into the path of the plunger of that jack; another spring for connecting with a generator and located in the path of the said plunger beyond the central-telephone-connecting spring; the said plunger being provided with a projection of insulating material interposed at a point to break the contact of the central-telephone-connecting spring with the plunger when the latter is in contact with the generator-connecting spring, substantially as described.

4. In telephone systems, metallic spring-jack frames having each a slideway for a

switch-plug, a metallic plunger fitted to reciprocate in contact with each frame in line of the said slideway and provided with a return-spring; a spring for connecting each jack with the line of a central telephone and another spring and line for connecting with a generator, these two springs being located for temporary contact with the said plunger; a subscriber's communicating spring projecting into the said slideway in each spring-jack in the path of a switch-plug and fitted for metallic contact with that spring-jack frame; and a pair of switch-plugs having metallic nibs electrically connected through a cord, the nibs being fitted each to engage one of the subscriber's communicating springs, substantially as described.

5. In telephone systems, spring-jacks, each provided with a central-telephone-connecting spring, a generator-connecting spring, and a subscriber's communicating spring; a plunger fitted to reciprocate in each spring-jack to engage either of the first two-named springs; and a pair of connected plugs, each fitted to operate a plunger and provided with a metallic nib fitted to engage a subscriber's communicating spring.

6. In telephone systems, a switchboard having spring-jacks with apertures to receive each a switch-plug; a drop-shutter hung to move to and from the spring-jack and having an aperture to register with the aperture in the spring-jack when the shutter is closed or set, and connecting-plugs for the spring-jacks; the plugs and the holes in the shutters being so proportioned that a shutter may partially drop onto the plug while the plug remains inserted in the spring-jack, substantially as described.

7. In telephone systems, metallic spring-jack frames; subscribers' lines connected therewith; each jack having a passage to receive a switch-plug; a communicating spring connected with the winding of the magnetic coil of the drop; the free end of the spring projecting into the said plug-passage and resting normally on a metallic stud of the spring-jack frame; a plunger in contact with the frame and in line of the plug-passage, and a spring in line of the plunger, this spring being connected with a source of electricity; a pair of connected switch-plugs each having a necked metallic nib, and a larger body of insulating material to slide within the said plug-passage, keeping the nib insulated from the frame; a central operator's line and means electrically connecting it with the said plunger; the said plug-nib being adapted to engage its neck with the said communicating spring and being insulated both from the plug and frame when the source of electricity is connected, substantially as described.

8. In telephone systems, a spring-jack connected with a subscriber's line and having a sliding metallic plunger; a spring connected



with a central operator's line and having its  
free end located in the path of the plunger  
and beyond its end normally; another spring  
located in the path of the plunger beyond the  
5 operator's line-spring and connected with a  
source of electricity the said plunger having  
an insulating-collar to disengage the opera-  
tor's spring when the generator is in connec-  
tion substantially as described.

In testimony whereof we affix our signa- 10  
tures in presence of two witnesses.

CHARLES E. EGAN.  
BURTON L. LAWTON.  
ERNEST C. WILCOX.

Witnesses:

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