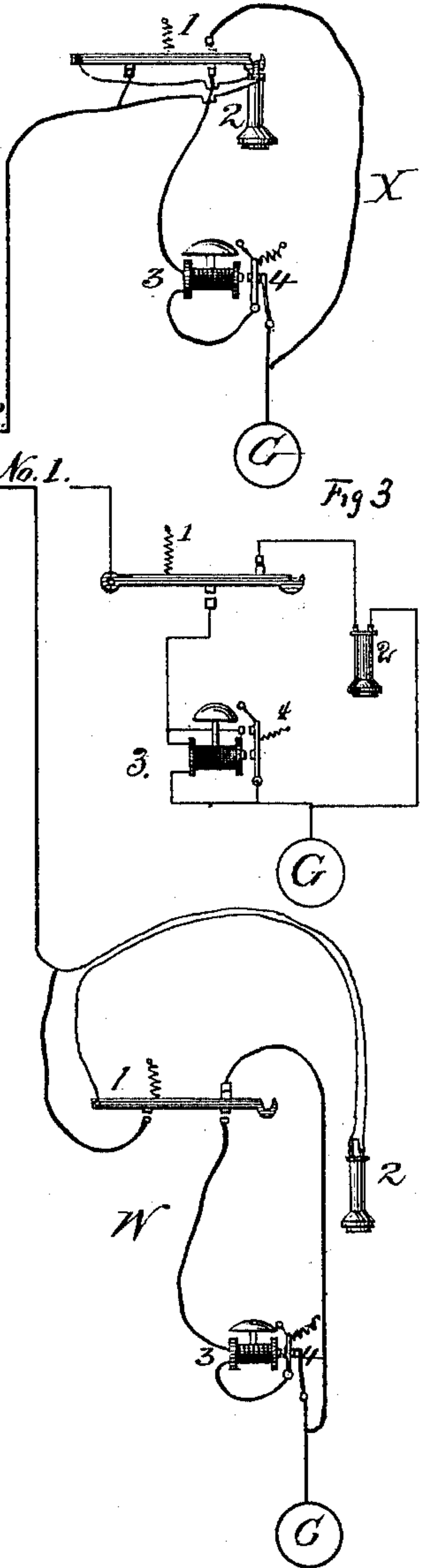
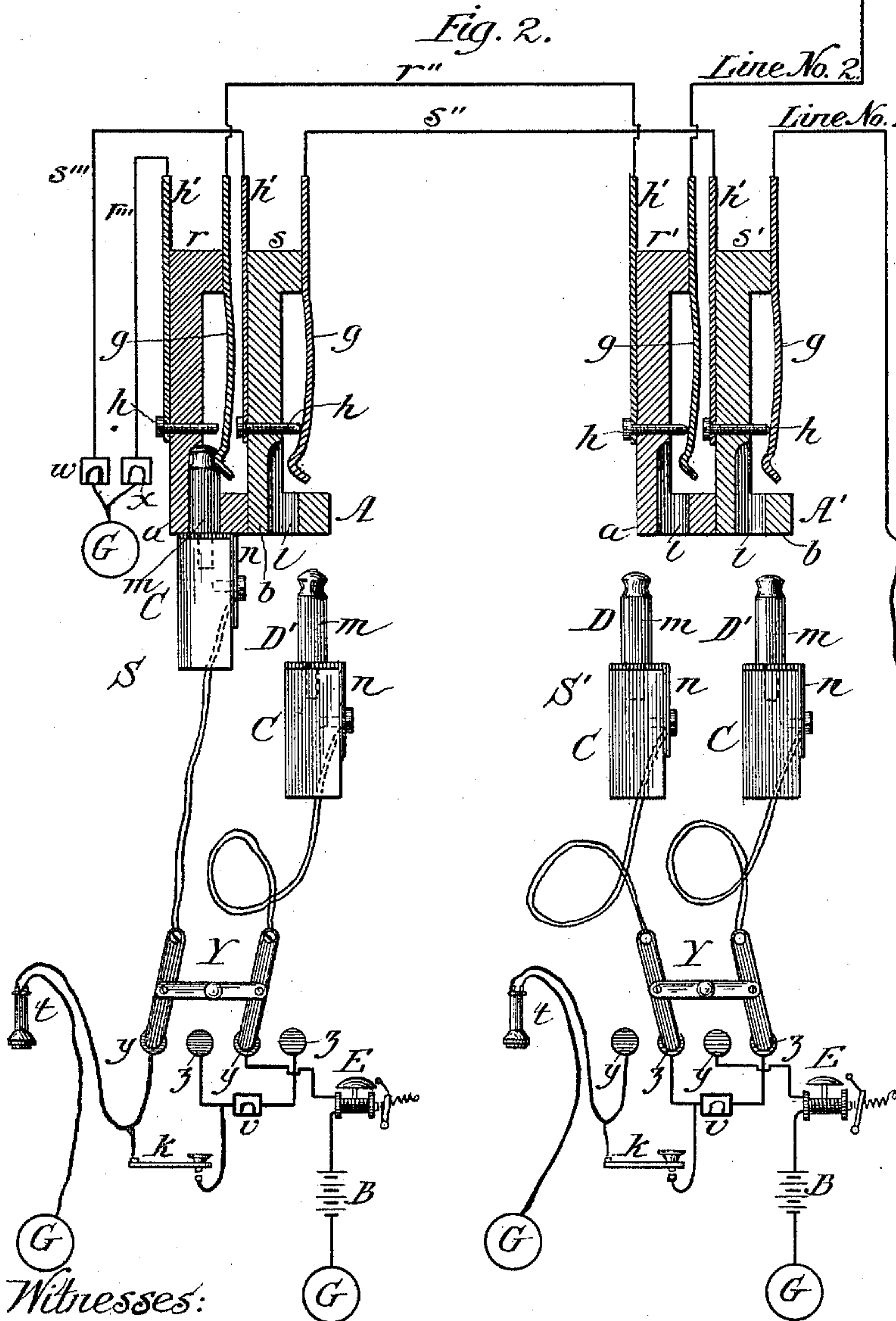
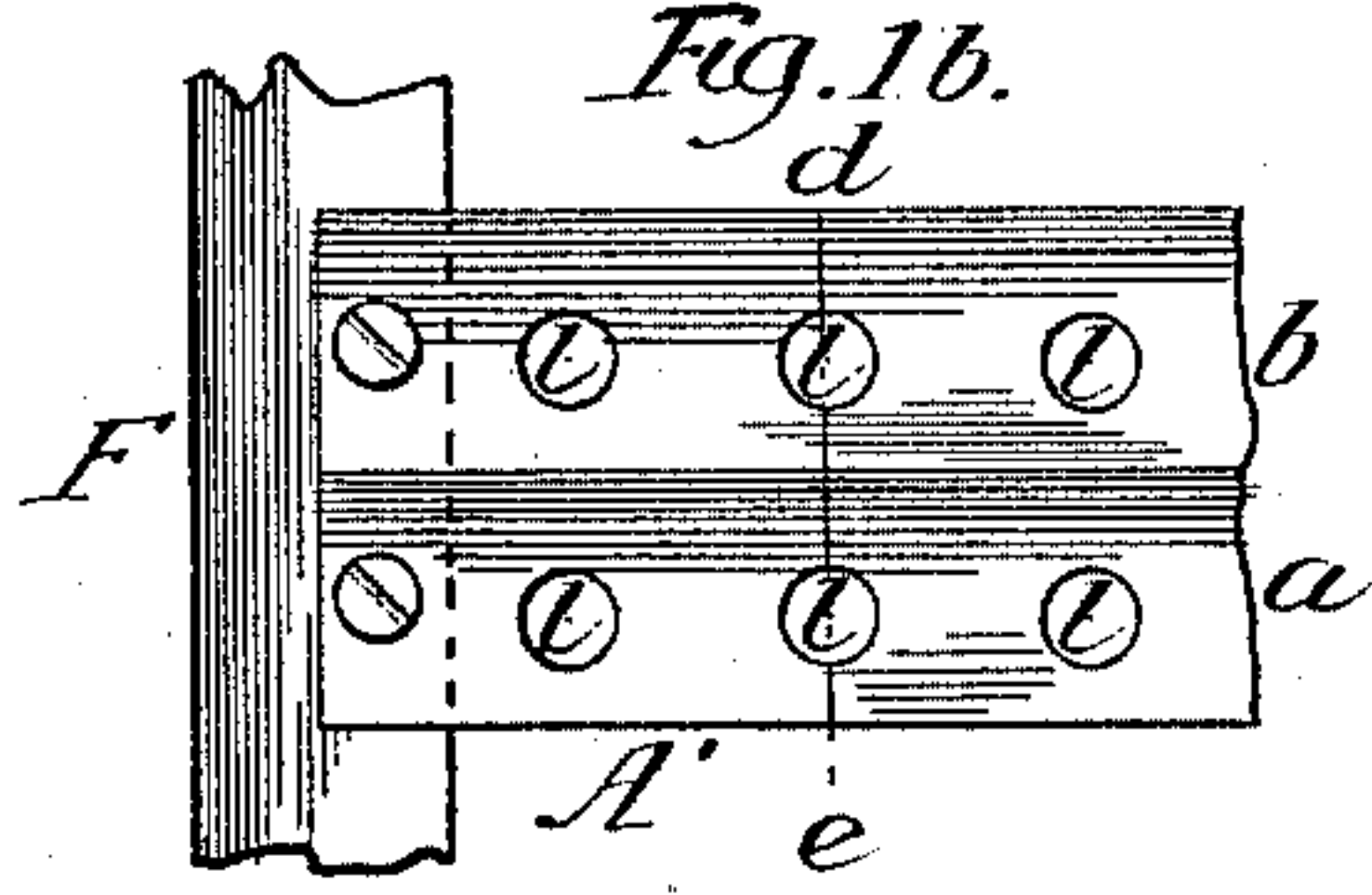
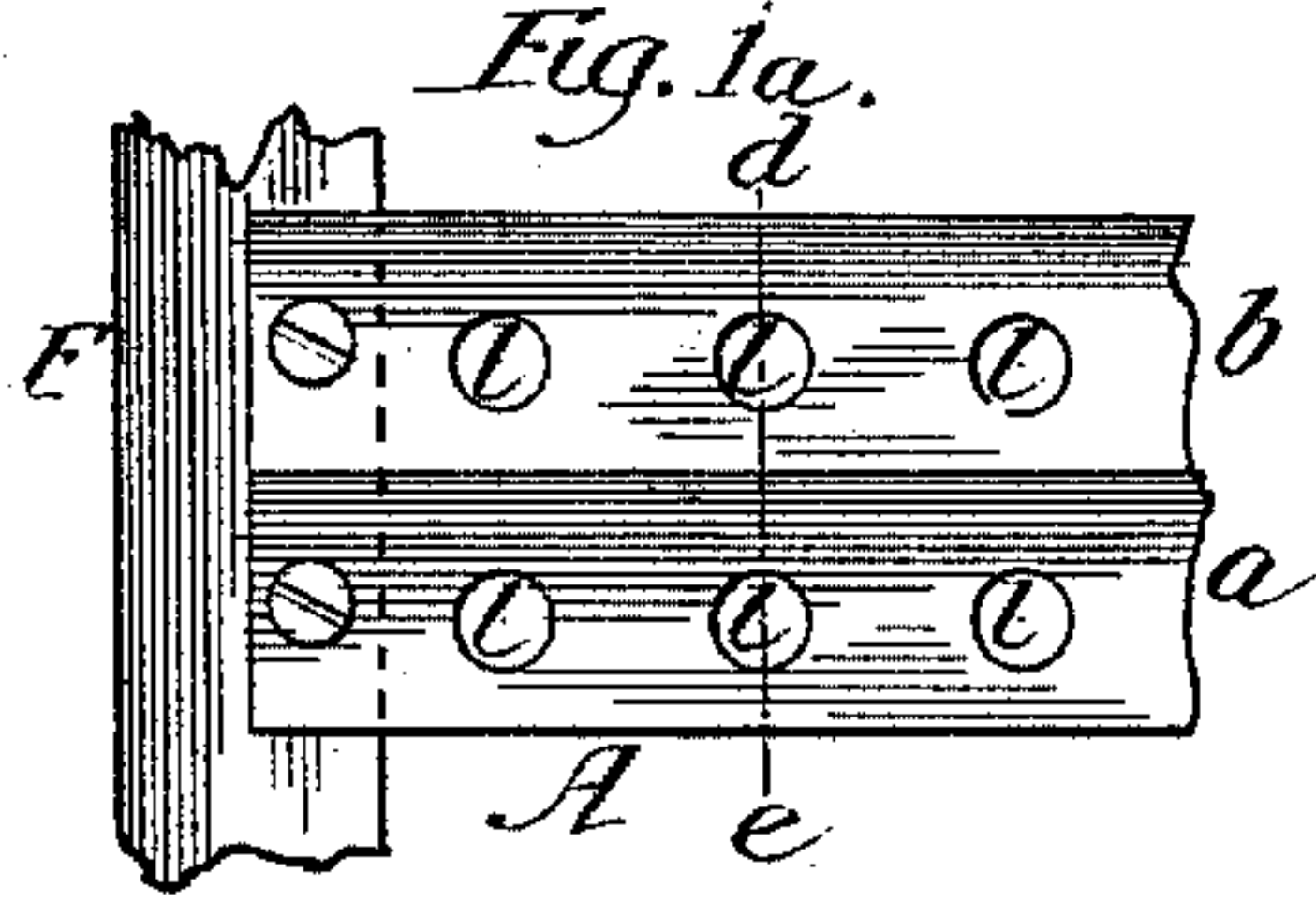


(No Model.)

M. G. KELLOGG.  
MULTIPLE SWITCHBOARD.

No. 592,302.

Patented Oct. 26, 1897.



Witnesses:  
Frank Blanchard  
Fred Gerlach

Inventor:  
Milo G. Kellogg



# UNITED STATES PATENT OFFICE.

MILO G. KELLOGG, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE KELLOGG SWITCHBOARD AND SUPPLY COMPANY, OF SAME PLACE.

## MULTIPLE SWITCHBOARD.

SPECIFICATION forming part of Letters Patent No. 592,302, dated October 26, 1897.

Application filed May 19, 1887. Serial No. 238,727. (No model.)

*To all whom it may concern:*

Be it known that I, MILO G. KELLOGG, of Chicago, (Hyde Park,) Illinois, have invented certain new and useful Improvements in Multiple Switchboards for Telephone-Exchanges, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates especially to exchange systems where the subscribers' lines are normally grounded at the central office and are grounded after passing through the subscriber's-station outfits.

It consists, first, of a multiple-switchboard system of operating an exchange of such lines and testing at any board to determine whether any given line is in use, which system I shall hereinafter describe and claim in detail.

In my multiple-switchboard system I place as many switchboards in the central office as are found necessary or desirable in order to properly answer the calls and connect and disconnect the subscribers' lines. On each board I place for each telephone-line which centers at the office a spring-jack or similar switch having two contact-points normally in contact, said switch being adapted to receive a plug and when the plug is inserted to disconnect the contact-points and connect one of them to the metal piece of the plug, to which is attached a flexible conducting-cord, and when the plug is withdrawn to again connect the contact-points, as above. The surfaces of the switch-holes are rubber and the plugs are made to practically fit the holes, and the metal pieces of the plugs bear on the rubber surfaces of the holes. The switches of a line on the different boards may be called a "series" of switches. The switching apparatus may, however, be varied without departing from my invention.

Figures 1<sup>a</sup> and 1<sup>b</sup> of the drawings are front views of sections of two multiple switchboards to which the same wires are connected. Fig. 2 shows a complete diagram of the system, including the central-office switchboards and apparatus, the subscriber's-station apparatus, and the lines and connections necessary to operate them according to my invention. Fig. 3 illustrates a modification in which the circuit of the subscriber's bell is shunted.

In the drawings like parts and apparatus are indicated by the same letters and figures of reference.

In Fig. 2, A is a sectional view of the switchboard shown in Fig. 1<sup>a</sup>, as indicated by line *d e*, and A' is a sectional view of the switchboard shown in Fig. 1<sup>b</sup>, as indicated by line *d e*.

*a b* represent rubber strips on which the metal parts of the spring-jack switches are mounted. These strips may be long enough to receive any convenient number of spring-jack parts.

*l l*, &c., are round holes through the front of the strips adapted to receive the switch-plugs. The contact-springs *g g*, &c., are mounted on the rubber strips to the rear of and parallel to the holes *l l* to which they belong, as shown. The contact-points *h h*, &c., on which the contact-springs or spring-levers normally bear, pass through the strips and have connecting-pieces *h' h'*, as shown.

The switch-plugs are substantially as shown and as will hereinafter be described.

The several parts mentioned above are so made, shaped, arranged, and adjusted that when a plug is inserted into any of the holes it raises the spring-lever in the rear of the hole from the contact-point on which it normally bears, and the metal piece of the plug, and consequently its conducting-cord, is connected to the spring-lever. Each section of a rubber strip, with its spring-lever, contact-point, and the hole, all arranged and operating as above, may be called a "spring-jack" switch.

Two subscribers' lines are shown in the drawings. They are marked line No. 1 and line No. 2. *s* and *s'* are the switches of line No. 1 on the two boards, and *r* and *r'* are the switches of line No. 2 on the two boards. Line No. 1, after entering the office, passes to the spring-lever *g* of switch *s'*, and thence through contact-point *h* and connecting-piece *h'* of that switch and wire *s''* to spring-lever *g* of switch *s*, and thence through contact-point *h* and connecting-piece *h'* of that switch and wire *s'''* to the annunciator *w*, and thence to the ground. Line No. 2 is shown as connected in the same manner. The other wires of the exchange would be connected through their switches in a similar manner. Other boards might be added to the exchange, and the circuit of the lines through their respective series



of switches on the different boards would be similar to the above and such as will be apparent to those skilled in the art. The annunciators may be placed at the several boards in a manner so that the operators may conveniently answer the calls of the exchange.

W and X in Fig. 2 are subscriber's station outfits, W being for line No. 1 and X for line No. 2. 1 is the telephone-switch, with contact-points, substantially as shown. 2 is the subscriber's telephone, adapted to be placed on the switch when not in use and to make connections, substantially as shown, when on and off the switch. 3 is the bell for receiving signals from the central office. It is a vibrating bell with circuit-breaking points at 4. Instead of the circuit of the bell being broken during the vibrations of the hammer the bell-magnets may be shunted in a well-known manner for the construction of vibrating bells. Such an arrangement is shown in Fig. 3 of the drawings. G represents the ground. The circuits are substantially as shown. It is evident that when a telephone is on a switch at the subscriber's station the telephone is shunted out of the circuit of the line and the vibrating bell is in the circuit of the line and ground, and when a telephone is off from its switch the telephone is in the circuit and the vibrating bell is switched out of the circuit of the line and ground. The telephone is shown as being on the switch at X and as being off from the switch at W.

S S' in Fig. 2 are operators' systems of cords with plugs, keys, switches, clearing-out annunciators, operator's telephone, calling-battery, and circuits. One system is shown at each board and is intended for one operator. Only one pair of cords, with its plugs, key, switch, and clearing-out annunciator, is shown in each system. Others could be added in a manner which will be apparent to those skilled in the art.

D D' are the switch-plugs connected to the pair of cords.

m m are the metal pieces of the plugs adapted, when inserted in a switch, to separate the spring-lever g of the switch from the contact-point h and form a connection with the spring-lever. n n are connecting-pieces, as shown, to connect the metal pieces m m with the flexible conducting-cords.

C C are the rubber handles of the plugs.

Y is a double-lever switch by which the operator may at will place the levers of the switch on the contact-bolts y y or on z z. The cross-piece between the levers may be of rubber, as is usual.

k is a listening-key. A two-point switch or similar device might be used in its place.

t is the operator's telephone, and B is her signaling-battery.

E is a bell or similar test receiving instrument adapted to strike whenever the battery is closed through it. The circuits are substantially as shown.

G in each case in the drawings represents

the ground connection, and v is the clearing-out annunciator.

It is evident that when the levers of the switch Y are on y y the plug D is grounded through the operator's telephone and the plug D' is grounded through the test receiving instrument and the generator, and the plugs are disconnected except through the ground, and when the levers are on z z the plugs are disconnected from the ground, the telephone, the test receiving instrument, and generator, and are connected together, and the clearing-out annunciator is in their circuit. If, when they are thus connected together, their listening-key is depressed, the joint circuit is grounded through the operator's telephone.

The operation of the whole system is as follows: When an operator sees a call on a calling-annunciator, she places D of a pair of plugs in the spring-jack at her board of the line calling and by conversation finds out what line is wanted. She then places plug D' of the pair of cords in the spring-jack switch of the line wanted, and in doing so disconnects the line from the ground and at the same time sends the signaling-battery current to the line. If the subscriber's vibrating bell is in circuit with the signaling-current, the bell will vibrate and the subscriber will be called, and the operator's test receiving instrument will vibrate in unison and the operator will thus know that the line is not in use. She will then move the switch-levers to z z, and the two lines will then be connected together for conversation with the clearing-out annunciator in circuit. If she wishes to see whether the subscribers are through conversation, she may press on key k and her telephone will be connected to the circuit through a third leg to ground. If, when an operator places a plug D' in a spring-jack switch of a line (the levers of the switch Y corresponding to the plug being on y y) the test receiving-bell does not vibrate, she knows that the signal-bell at the subscriber's station is not in circuit with her bell and signaling-battery, and therefore that the line is switched or in use. The failure to receive the test-signal will be due either to the fact that the telephone is off from its switch at the subscriber's station or to the fact that there is a plug in some switch of the line between the one where the test is made and the subscriber's station. If it is due to the former condition, she will generally hear one stroke of her bell, and if to the latter she will not hear that even.

A constant-current dynamo might be used for signaling instead of the battery mentioned above. I have not shown or described the subscriber's signaling apparatus. This may be a generator or a battery of sufficient force to actuate the calling-annunciator through the subscriber's line.

The levers of the switches Y should remain normally on bolts z z. When the operator receives a call on an annunciator, she moves



the levers of the switch she is to use for the connection to *y y*, and when they are in that position she receives the order, removes the ground from, and makes the signal and test  
5 of the line wanted. She then moves the levers to *z z*, as stated above.

When in this system neither the line is switched for use at any board nor the subscriber's telephone is switched for use, and a  
10 switch-plug is placed in the line-switch at any board, both the subscriber's bell and the operator's signal-bell will sound, thereby both calling the subscriber and indicating to the operator that the line is not in use. If the  
15 plug is inserted in the line-switch at one board, as at A, and the line is already switched at another board connected with the line-circuit at a point nearer the subscriber's station, as at A', the subscriber's bell and the operator's  
20 bell will not sound, whether or not the subscriber's telephone is switched for use. The operation of placing a switch-plug in the switch of a line therefore indicates to the operator either that the subscriber's telephone  
25 is switched for use or that the line is switched at some switch which is between her switch and the subscriber's station.

I claim as my invention and desire to secure by Letters Patent—

30 1. In a telephone-exchange system, multiple switchboards, telephone-lines each normally grounded at the subscriber's station, and having an automatic vibrator controlled by a switch at the subscriber's station, which  
35 cuts out the contacts for said vibrator when the subscriber's-telephone apparatus is in use, in combination with switches, one for each line on each board, each switch having a spring and a contact-piece with which the  
40 spring is normally in contact, each line passing successively through such normally closed pairs of contacts of the line on the several boards, passing in each case to the spring first and from the last contact to ground, test  
45 receiving instruments, one at each board, each grounded on one side and connected on its other side to a plug adapted to be placed in any switch at its board and when so placed to separate the spring from the contact-piece  
50 and form contact with the spring, and battery in any test-circuit thereby established,

said test receiving instruments being so constructed in relation to each circuit-breaker and the battery that it responds to the circuit-breaker when in closed circuit with them. 55

2. In a telephone-exchange system, multiple switchboards, telephone-lines each normally grounded at the subscriber's station, and having a circuit-changer controlled by a switch at the subscriber's station, which cuts  
60 out said circuit-changer when the subscriber's-telephone apparatus is in use, in combination with switches, one for each line on each board, each switch having a spring and a contact-piece with which the spring is normally  
65 in contact, each line passing successively through such normally closed pairs of contacts of the line on the several boards, passing in each case to the spring first, and from the last contact to ground, test receiving in-  
70 struments, one at each board, each grounded on one side and connected on its other side to a plug adapted to be placed in any switch at its board and when so placed to separate the spring from the contact-piece and form  
75 contact with the spring, and battery in any test-circuit thereby established, said test receiving instruments being so constructed in relation to each circuit-changer and the battery that it responds to the circuit-changer  
80 when in closed circuit with them.

3. In a telephone-exchange system, the combination of multiple switchboards, lines grounded at the subscribers' stations, normally grounded at the central office, and  
85 having automatic vibrators controlled by switches at the subscribers' stations, which cut out the contacts for said vibrators when their telephone apparatus is in use, with a test-circuit for each board at the central of-  
90 fice, grounded on one side and having included in it, a test receiving instrument, switching apparatus having circuit connections whereby the operator may, in one operation or motion, both disconnect any of said  
95 lines from its office ground and connect it to said test-circuit, and signal-battery in said test-circuit, substantially as set forth.

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Witnesses:

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