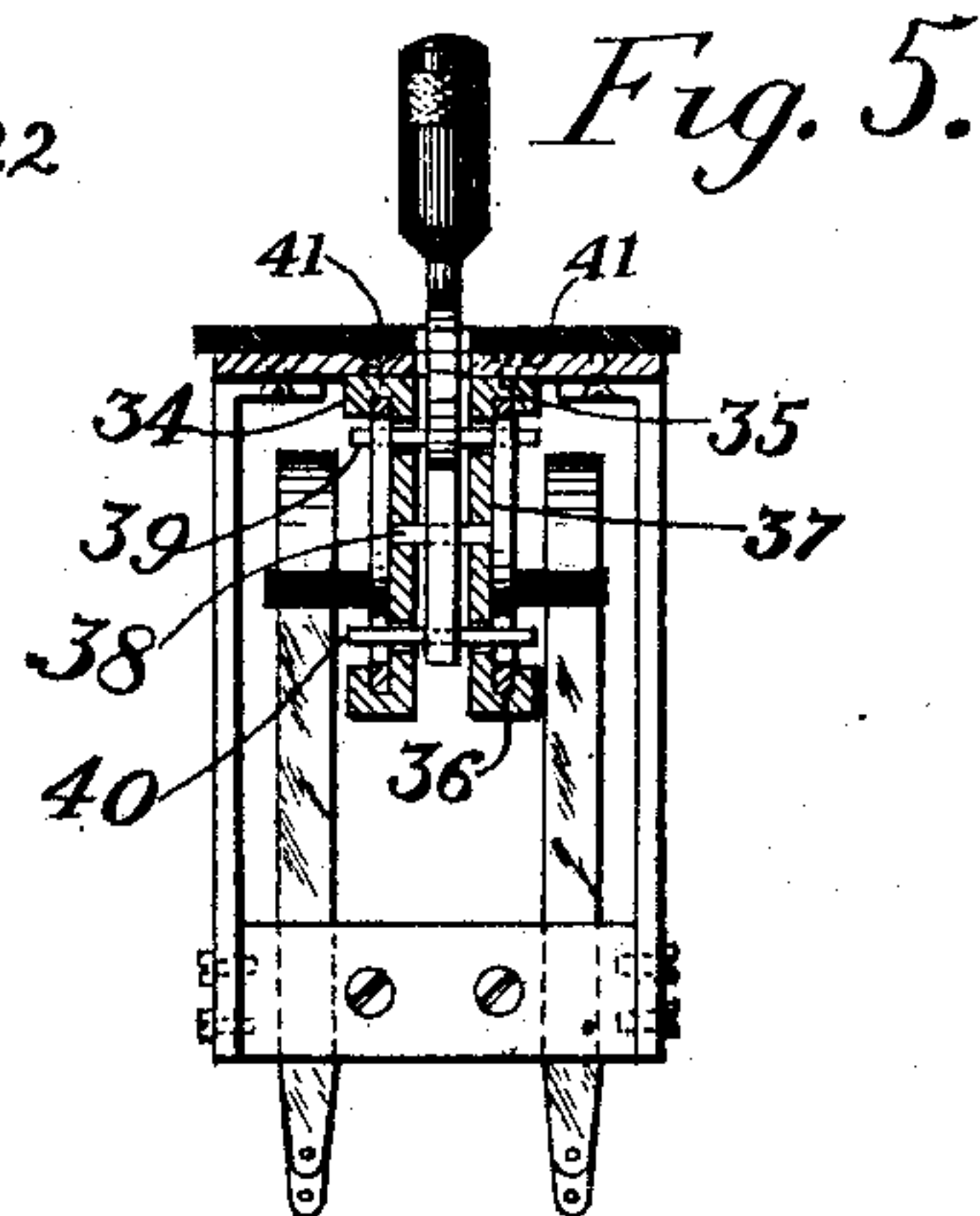
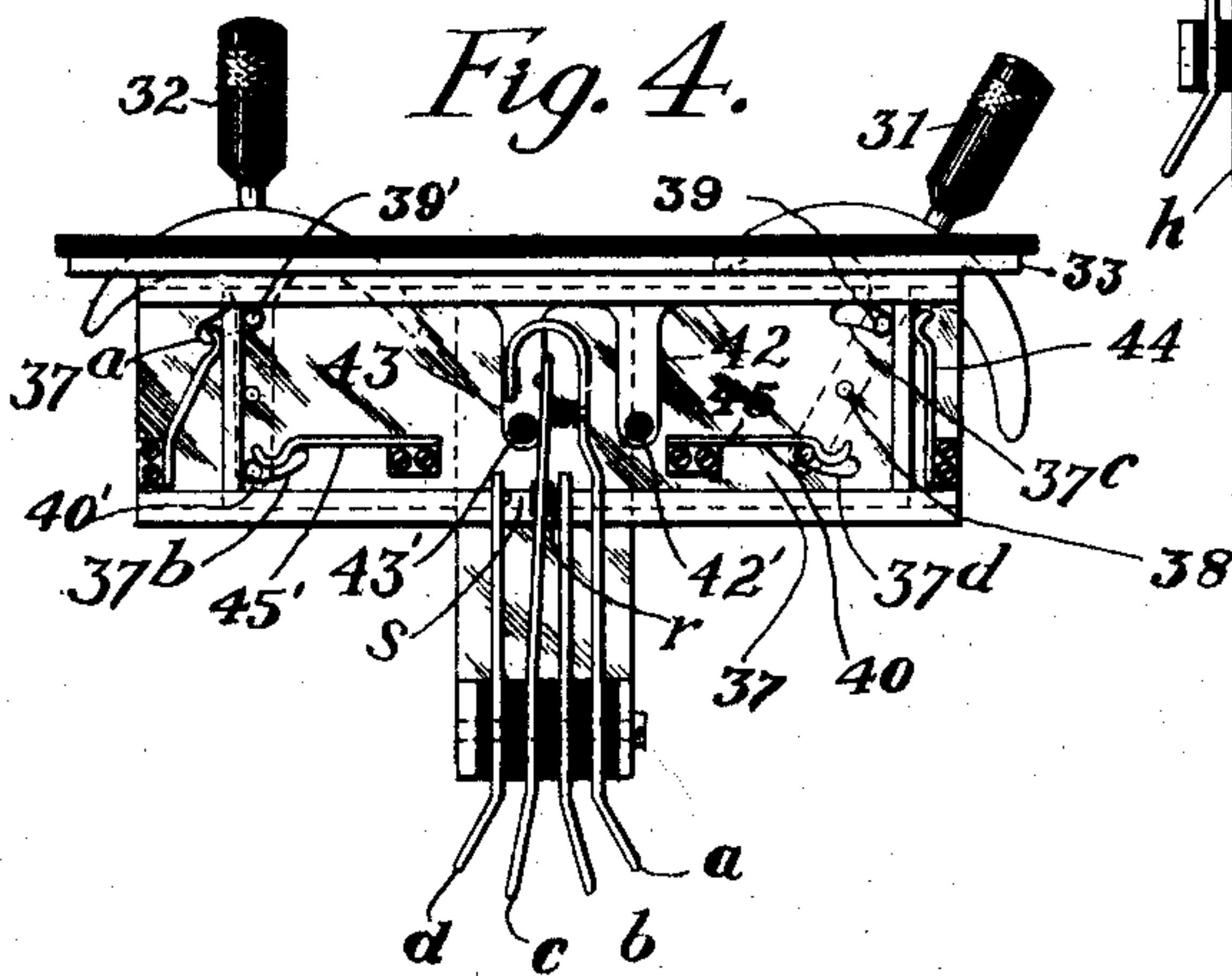
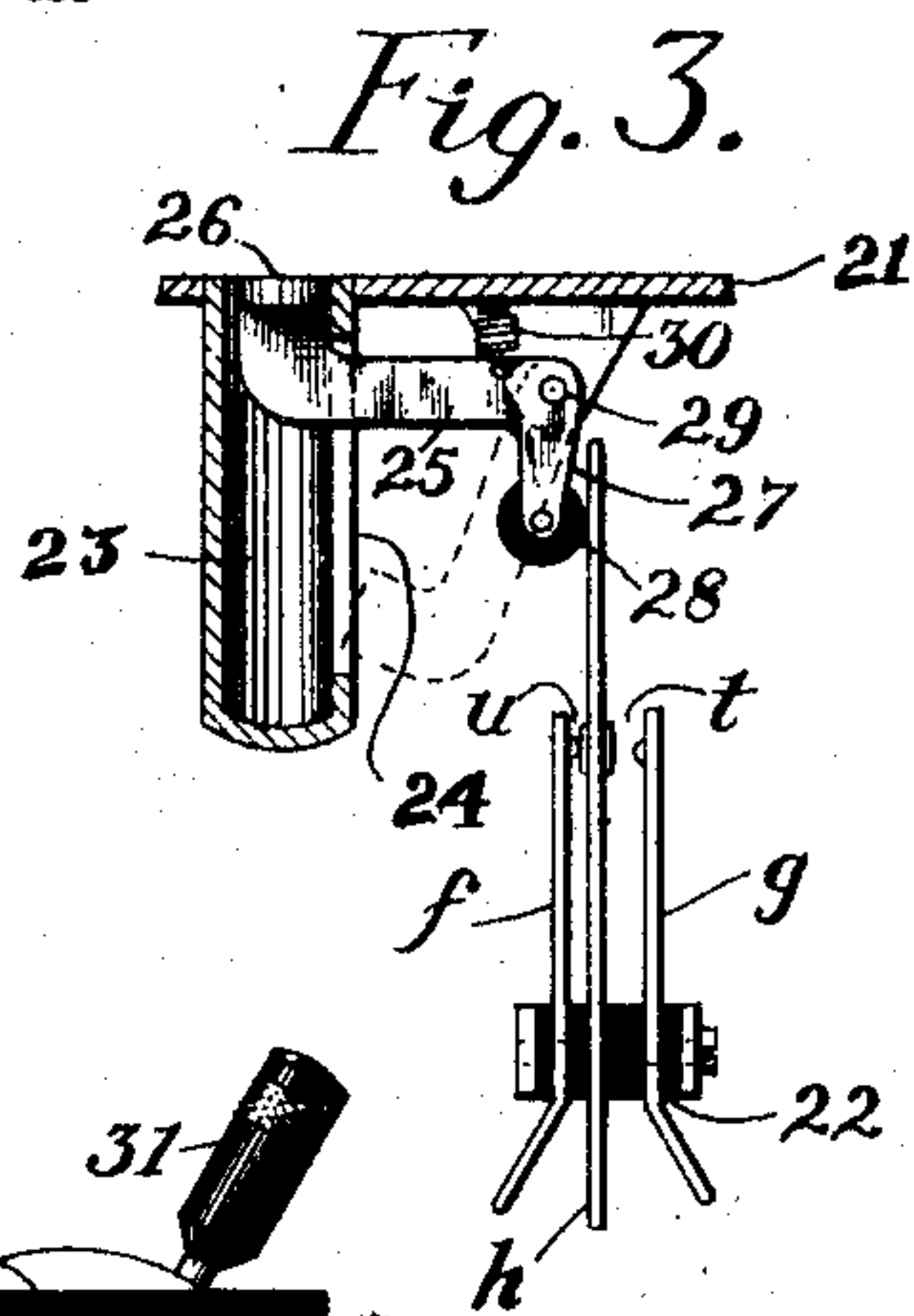
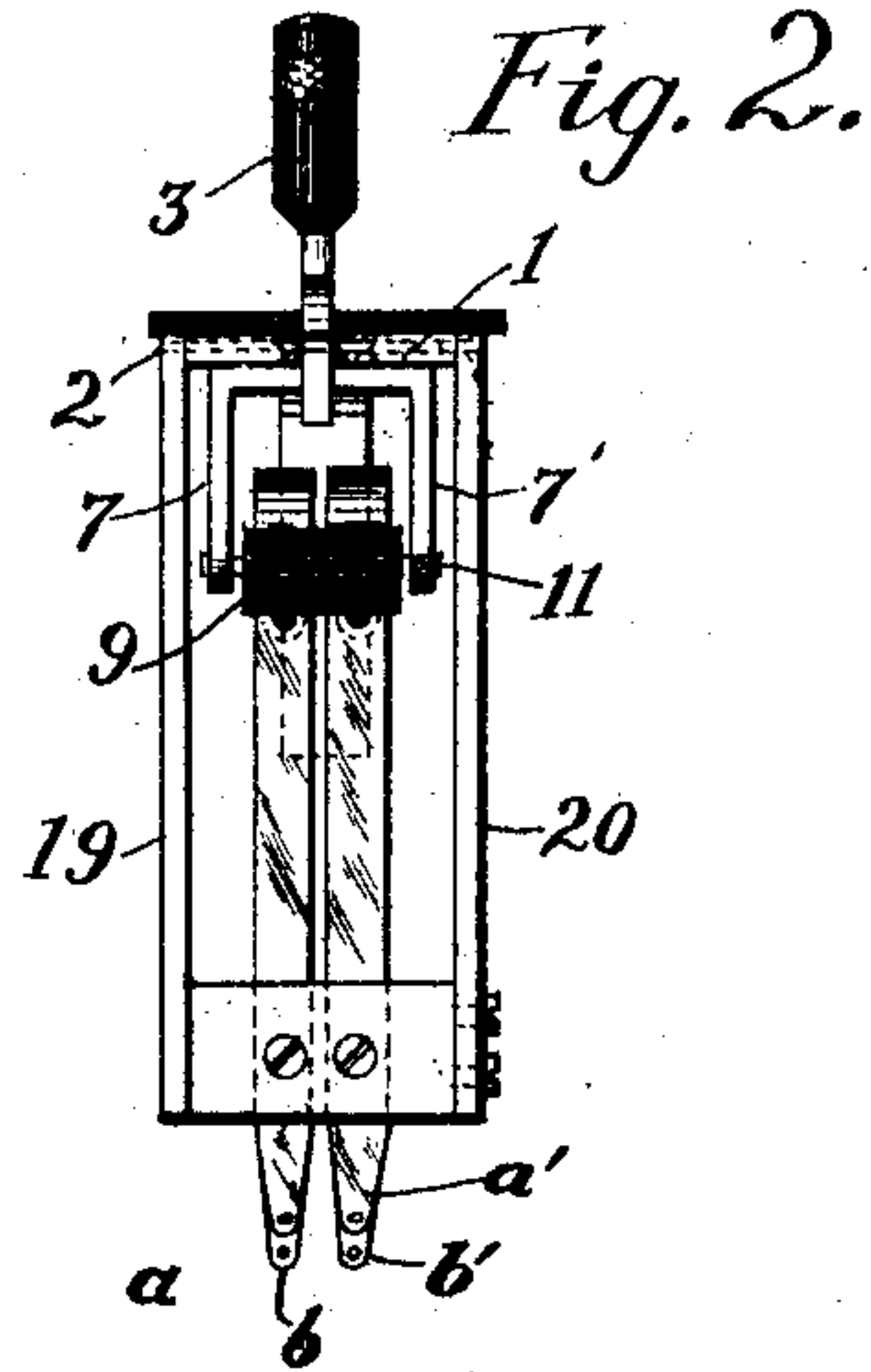
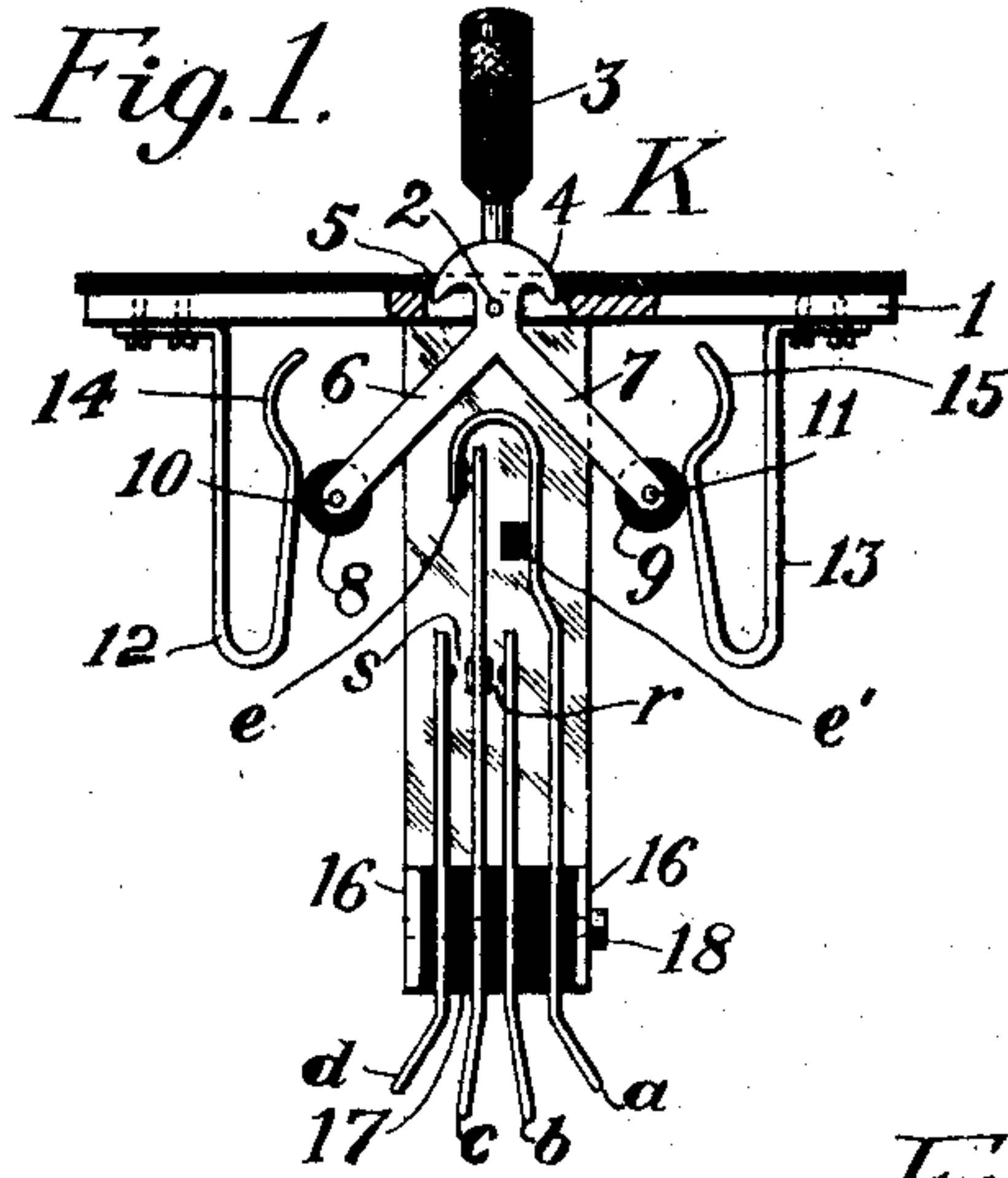


983,898.

Patented Feb. 14, 1911.

3 SHEETS-SHEET 1.



Witnesses
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R. A. Stanley.

By

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RINGING KEY.

APPLICATION FILED JAN. 23, 1908.

Patented Feb. 14, 1911.

3 SHEETS-SHEET 2.

983.898.

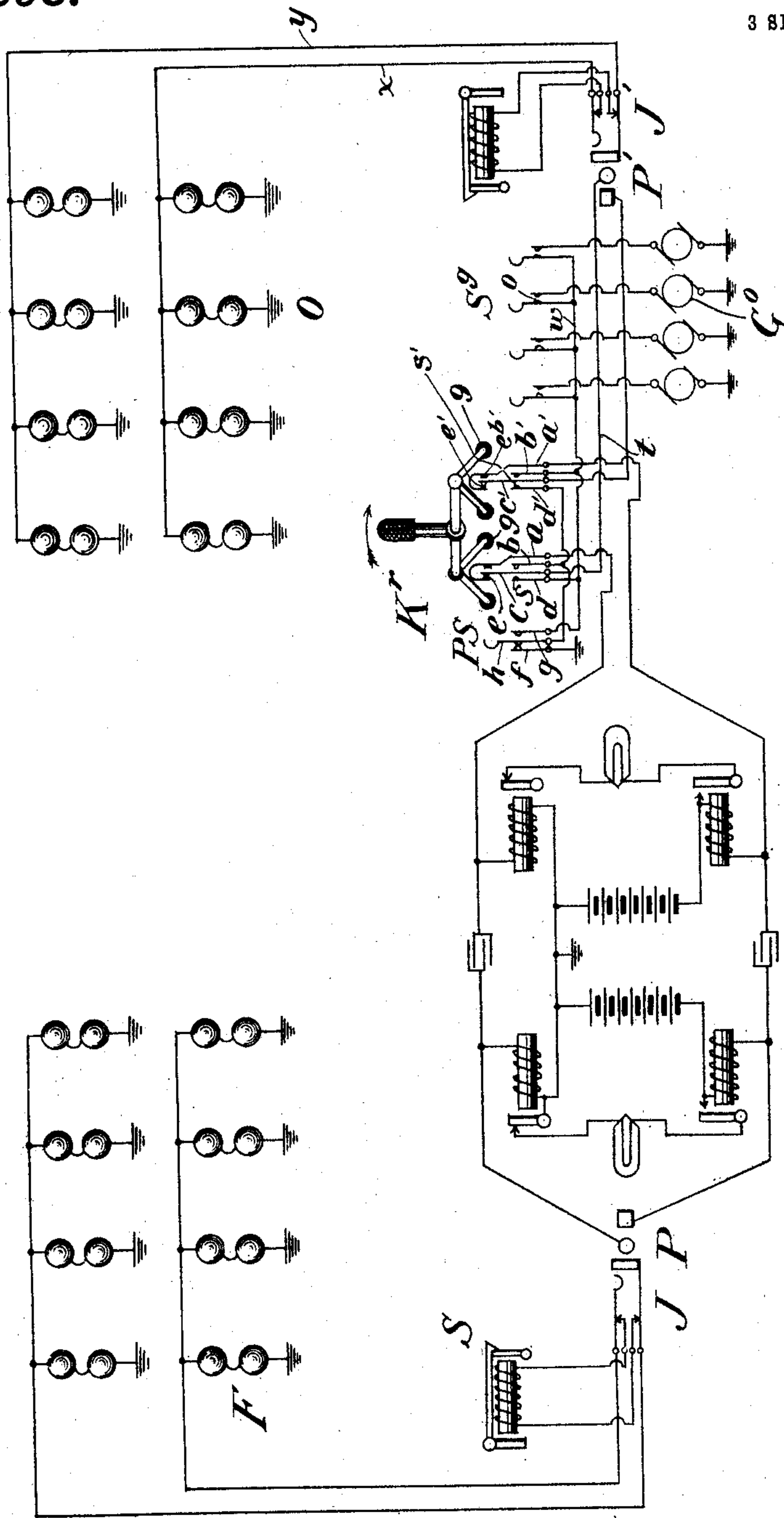


Fig. 6.

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RINGING KEY.

APPLICATION FILED JAN. 23, 1908.

983,898.

Patented Feb. 14, 1911.

3 SHEETS-SHEET 3.

Fig. 7.

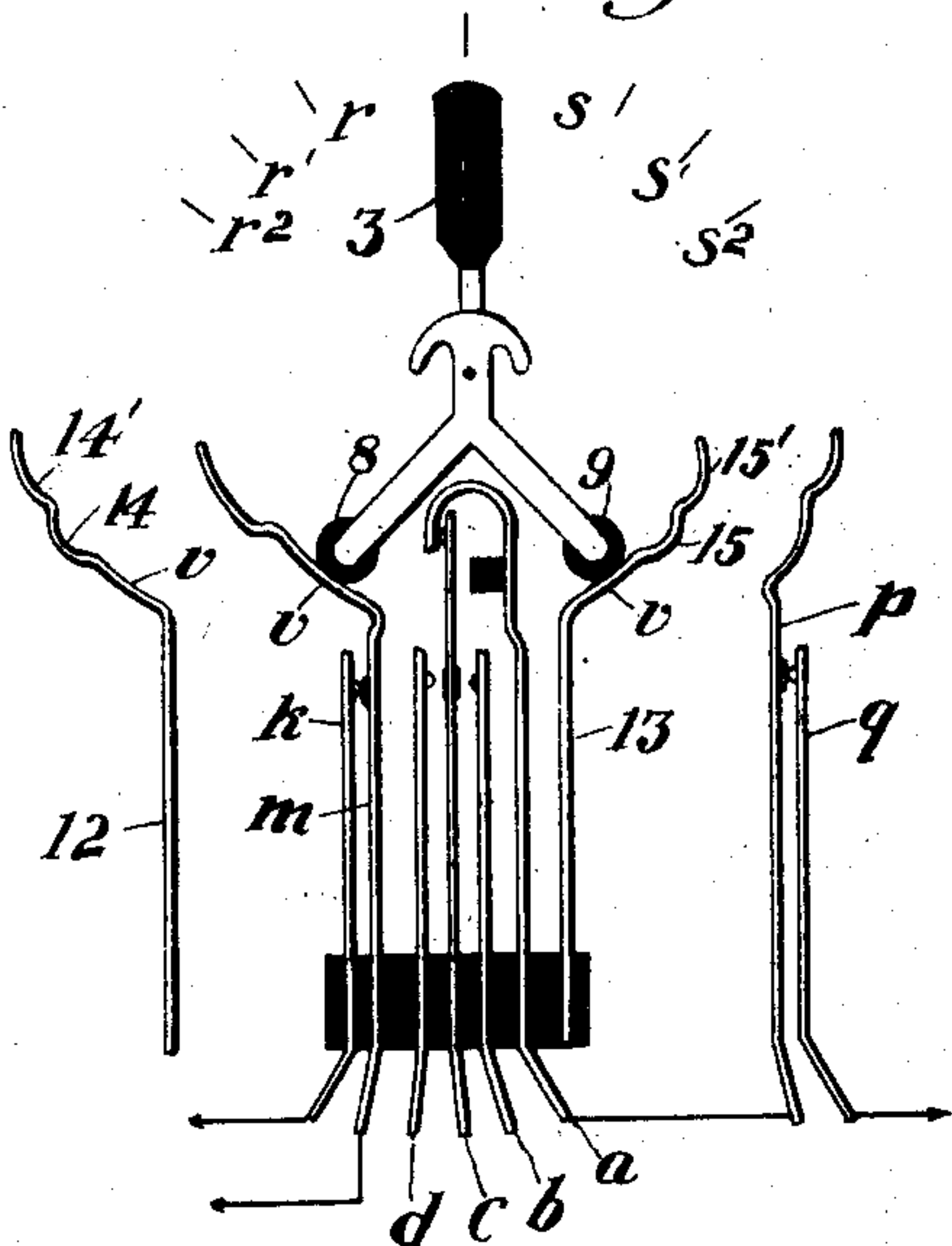


Fig. 8.

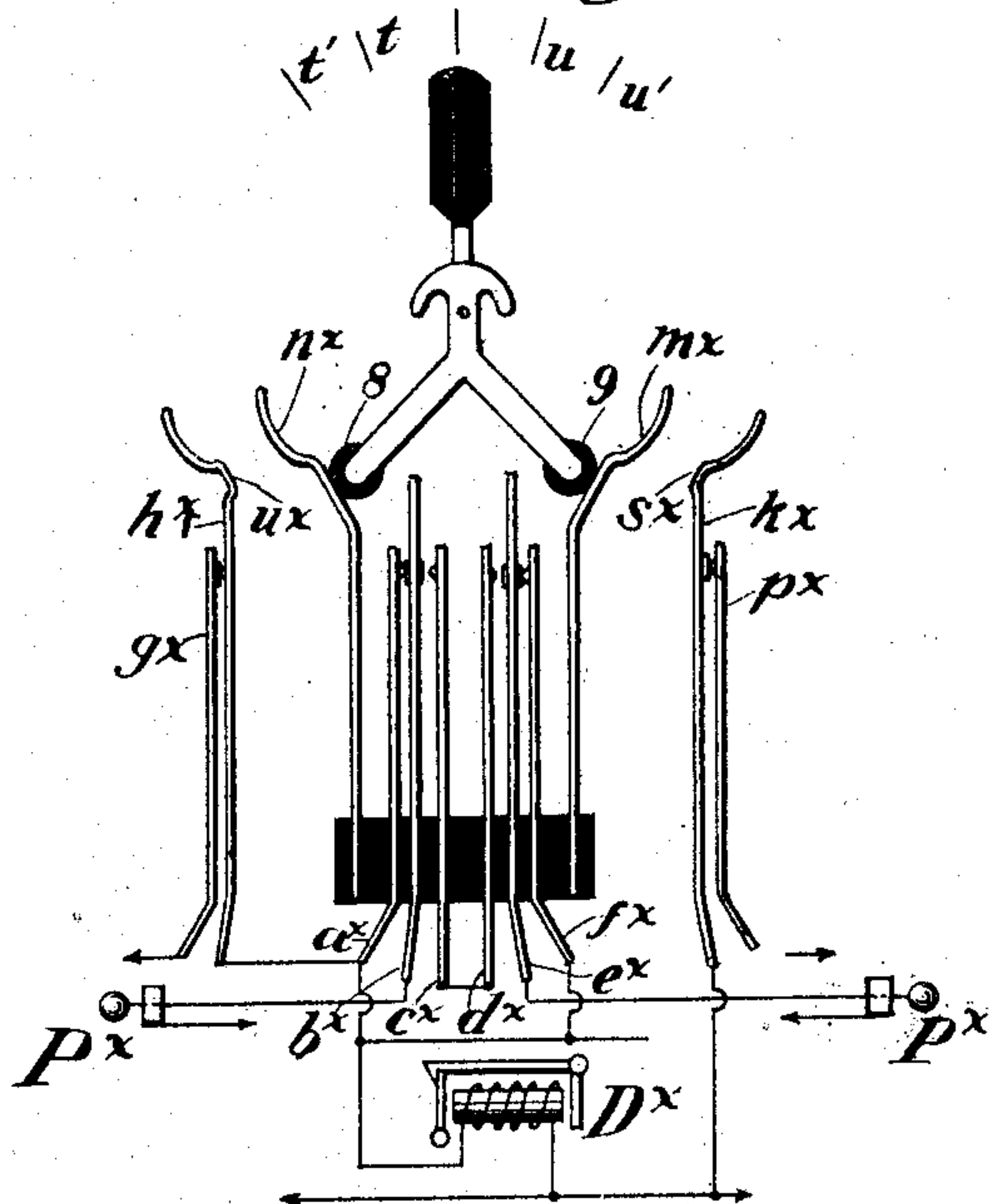


Fig. 9.

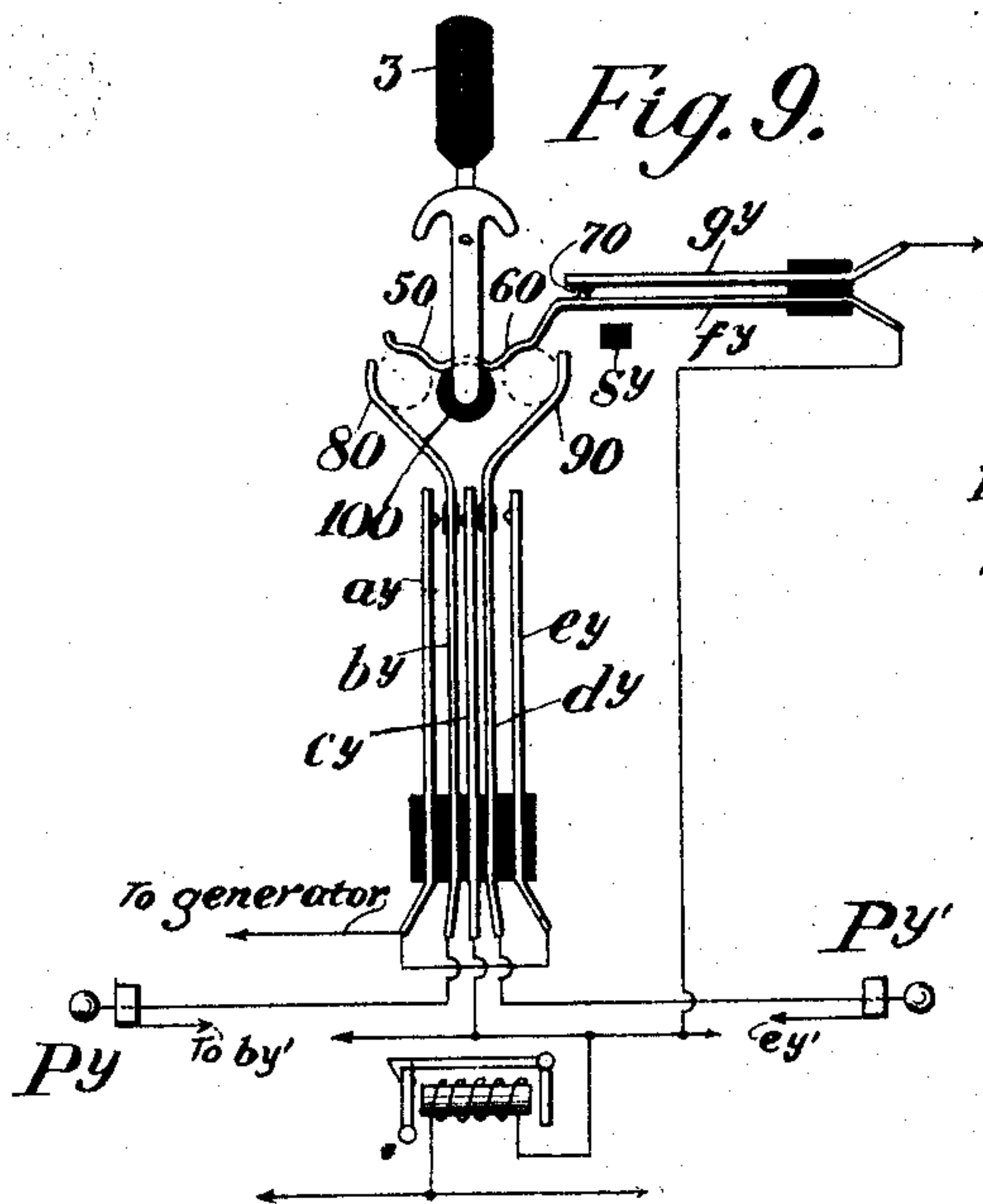
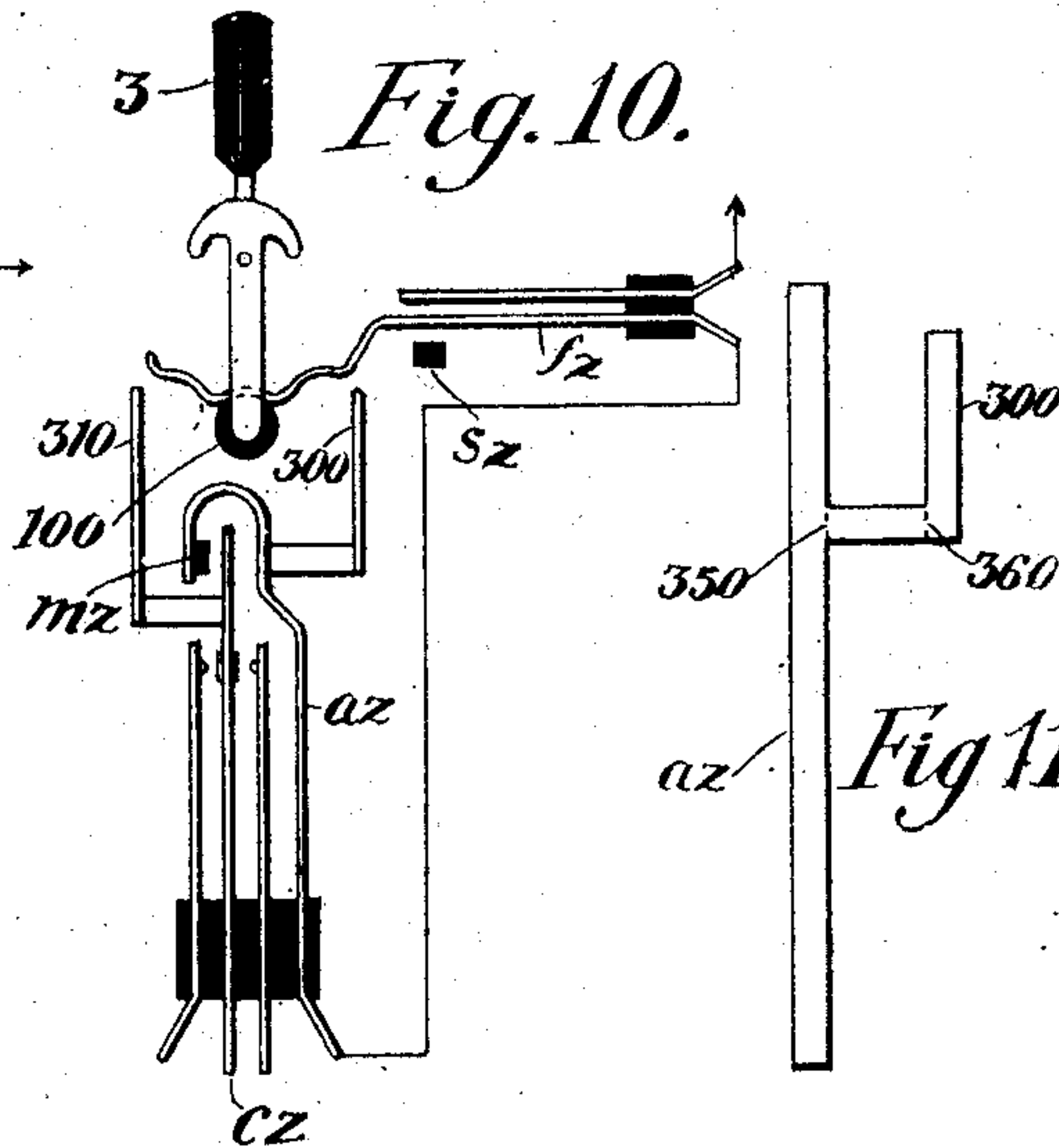


Fig. 10.



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UNITED STATES PATENT OFFICE.

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RINGING-KEY.

983,898.

Specification of Letters Patent.

Patented Feb. 14, 1911.

Application filed January 23, 1908. Serial No. 412,228.

To all whom it may concern:

Be it known that I, ELBERT R. HOBBS, a native-born citizen of the United States, residing at Buhl, in the county of Twin Falls and State of Idaho, have invented certain new and useful Improvements in Ringing-Keys, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to ringing keys for use in telephone systems, and it is particularly adapted for use in party-line systems employing harmonic ringing. In these systems ringing keys are generally employed in conjunction with the indicating keys or switches arranged to connect the proper generator to the line.

An object of my invention is to provide a device by the use of which the number of indicating keys can be reduced to approximately one-half of that ordinarily required.

A further object of my invention is to provide a key in which there are few moving parts and which is consequently not liable to easily get out of order.

A further object of my invention is to provide a device which can be used as a combined ringing and listening key.

A further object of my invention is to provide a key which may be retained in its shifted position thereby constituting an indicating key but which can be readily restored when desired to its normal position.

Other objects and advantages will appear in the following description of the invention.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is an end view of my improved ringing key. Fig. 2 is a side view of the key showing the two sets of contacts. Fig. 3 shows an operator's switch adapted to be used in connection with the ringing key. Fig. 4 shows a modified arrangement of the ringing key. Fig. 5 is a view partly in section showing the manner in which the switch plate is mounted. Fig. 6 is a diagrammatic view showing an operator's cord-circuit provided with my improved ringing key and an eight party-line circuit. Figs. 7 to 10 inclusive show modified forms of ringing keys. Fig. 11 is a detailed view of a contact.

Referring now to Fig. 1, the key which is denoted in general K, is shown mounted upon a plate 1 which forms the upper member of

the supporting frame, being pivoted at 2 for movement toward the right or left. The handle 3 of the key consists of hard rubber or other suitable material and the arc-shaped extensions 4 which are disposed in the opening 5 in the top of the plate 1 provide closures for excluding the dust when the key is turned out of its normal position. The bottom of the key is provided with downwardly diverging arms 6 and 7 on one end, and on the other end with similar downwardly diverging arms 6' and 7'. The pivot pin 2 is rigidly connected with the arms on either end of the key and also to the handle, and its terminals rest in suitable journals. Between the extremities of the corresponding pairs of arms 7 and 7' and 6 and 6' respectively, the rollers 8 and 9 are rotatively secured by means of the pins 10 and 11. These rollers are of insulating material such as is commonly used in devices of this kind. Secured to the under side of the plate 1 by any suitable means are the springs 12 and 13. These springs are made of flat strips of metal and are bent downwardly and then upwardly and have arc-shaped upper extremities 14 and 15 for purposes hereinafter explained. The contact springs are securely held between two metal strips 16 being separated from one another by suitable insulation 17, the insulation and the springs being firmly clamped between the plates 16 by means of the screws 18. This construction provides a unitary bottom member for the frame, the other members of the frame being the upper plate 1 and the side connecting pieces 19 and 20. Two sets of springs *a*, *b*, *c*, *d*, and *a'*, *b'*, *c'*, *d'*, are carried upon this bottom member and have their lower terminals extending below the insulation to afford a ready means of connection with the circuit wires. The two springs *b* and *d* are of the same length; the spring *c* extends upwardly beyond the latter, while the spring *a* extends beyond the spring *c*, is then bent over the top and down on one side, and is normally in engagement with the spring *c*. An insulating block *e'* is secured to the inner side of the spring *a* and is adapted to engage the spring *c* when the spring *a* is moved.

The operation of the device is as follows: Referring to Fig. 1, when the handle 3 is moved toward the left, the roller 8 engages the spring *c* thereby breaking contact at *e* between the springs *a* and *c* and establishing

a contact between the springs *b* and *c* at *r*. When the opposite roller 9 which has engaged the spring 13 reaches the arc-shaped portion of the spring, the latter moves forward beneath the roller and retains the key in its shifted position. A slight movement of the handle is sufficient to disengage it, however, and the key will assume its intermediate position under the influence of the spring. When the key is shifted to the right, the roller 9 engages the contact spring *a*, breaking the contact at 1 as before and the insulating block *c'* engages the spring *c* thereby effecting connection between the springs *c* and *d* at *s*.

Fig. 3 shows a type of switch which may be used advantageously with my improved ringing key. It comprises a frame having a top plate 21, a bottom piece 22 and side pieces not shown in the drawing. Attached to the bottom of the upper plate 21 is a cylindrical socket 23 having a closed lower end. In one side of the socket 23 there is an opening 24 through which the arm 25 of a bell crank lever projects. The outer end of this arm is bent upwardly and is provided with a button 26 adapted to fit snugly within the cylinder and to be normally disposed flush with the upper surface of the plate. The shorter arm 27 of the bell crank lever is provided with an insulating roller 28. The bottom piece 22 carries three contact springs. The two outer contact springs *f* and *g* are of the same length while the middle contact spring *h* projects upwardly beyond the other two. The lever, bearing the roller 28, is pivoted at 29 and the roller may be brought into engagement with the spring *h* by the operator pressing her pencil down upon the button 26, thereby forcing the arm 25 downwardly and bringing the roller 28 in contact with the spring. If the pencil is left in the cylindrical socket the arm 25 is prevented from returning to its normal position and the spring *h* which is normally in contact with the spring *f* at *u*, is held in contact with the spring *g* at *t*. On the withdrawal of the pencil from the socket the lever arm 25 is returned to its normal position by means of the spring 30 and the contact spring *h* again engages the spring *f*. It will be observed that this switch is out of the way of the operator since its operating parts are all below the level of the board. At the same time the switch is not likely to be forgotten because it can only be in operation when the pencil is left sticking in the socket.

In Fig. 4 I have shown a modification in which there are two switch-handles 31 and 32. These handles are mounted upon a top plate 33 in the manner indicated in Fig. 5. As shown in this figure there are two supporting pieces 34 and 35 which are attached to the under side of the top plate in any suitable manner. The upper and lower

edges of these supporting pieces are first bent laterally, the upper edge being then bent downwardly and the lower edge bent upwardly thereby providing ways 36 for the guidance of a movable frame 37. The switch handle is pivoted mid-way between the upper and lower edges of the supporting pieces 34 and 35 by means of the pins 38. On each side of the pivot pin 38 are the pins 39 and 40 which are rigidly secured to the switch handle and are arranged to move in arc-shaped slots in the supporting pieces 35 and 34 as the switch handle is moved. The frame 37 consists of a rectangular strip preferably punched from a flat sheet of metal and arranged to slide easily in the ways 36. Depending from the upper inner side of the frame are the arms 42 and 43, provided with insulating lugs 42' and 43' respectively, adapted to engage the springs when the frame 37 is shifted. It will be understood that the springs are supported in the same manner as those shown in Fig. 1, by the bottom of a frame whose end strips are not shown. At the ends of the supporting strips 35 and 34 are the springs 44, so adjusted as to keep the frame 37 in its normal position. The operation of this form of switch is as follows: When the key 31 in Fig. 4 is moved to the right, the pin 39 will engage the inner edge of the frame 37 and force it over to the right. The pins 39, 39', 40 and 40' have free movement in the arc-shaped slots 37^a, 37^b, 37^c and 37^d. The insulating lug 43' on the arm 43 engages the extended spring *c* and breaks its contact with *a*, the insulating lug 43' serving to take the place of the roller 8 in Fig. 1, while the insulating lug 42' takes the place of the roller 9 of Fig. 1. It will be observed that if the handle 32 is now moved to the left the pin 39' will engage the left end of the frame and will carry it toward the left, thereby bringing the insulating lug 42' into engagement with the spring *a*. At the same time the handle 31 will be restored to an upright position by the engagement of the right end of the frame with the pin 39. In order to insure the retention of the switch handles in their shifted and normal positions I have provided springs 45 and 45' provided with cam portions designed to engage the lower pins and to hold the switches against accidental movement while allowing a ready release when it is desired to move the handles. It will be understood that the springs 44 are only necessary when a common cut-out is used.

The above construction has these advantages among others: The position of the switch handles indicates the contacts that are closed. The moving of one handle into its operating position moves the frame and insures the positive restoration of the previously actuated switch.

Having now described the mechanical details of the key I will show how it may be used in connection with the eight-party harmonic system shown in Fig. 6. Let us assume that the party at station F wishes connection with a party at station O. The operator, noticing the drop signal S, plugs into the jack J with the answering plug P. After getting the number of the subscriber wanted she inserts the plug P' in the jack J' of the line leading to the station O. She then presses the button *o* of the indicating key set (shown diagrammatically at S^s) leading to the generator G^o whose frequency corresponds with that of the ringer at the station O. This connects the generator with the wire *w*. She then operates the ringing key K^r pushing the handle in the direction indicated by the arrow. It should here be stated that this key is only shown diagrammatically in Fig. 6 and that the two sets of rollers represent, in fact, but one set of rollers operating upon two sets of springs and are thus shown merely for convenience. The insulating roller 9 bearing against the contact spring *a* breaks the contact at *e* and forces the contact spring *c* against the contact spring *d*. At the same time the other end of the roller 9 engages the mate *a'* and breaks its normal contact with the spring *c'* at *e'*, while forcing the spring *c'* against the spring *d'*. The breaking of the contacts at *e* and *e'* cuts off the plug strands from the cord conductors and prevents ringing back in the ear of the operator. The closure of the contacts at *s* between the springs *c* and *d* connects the generator with the tip side of the plug while the closure of the contacts at *s'* between the springs *c'* and *d'* connects the sleeve side of the plug to ground through the normally closed contacts of the pencil switch PS. Generator current now flows from generator through *o*, *w*, *d*, *s*, *c*, tip side of plug and by wire *x* to station O and to ground. The grounding of the sleeve side of the plug-strand prevents false ringing on the line *y* should any receiver be off the hook. An inspection of Fig. 6 will show that by moving the key K^r in one direction or the other and pressing the key in the set S^s leading to the appropriate generator any one of the eight stations can be rung.

Sometimes it is desirable to ring on both of the line wires at the same time as for instance, when it is necessary to give a general alarm. I use for this purpose the pencil switch heretofore described and shown in Fig. 6 at PS. The middle spring *h* of this switch is normally in contact with the spring *f* the latter being connected to ground. The spring *g* is connected with the wire *w*. When the operator wants to ring on both line wires at the same time she inserts her pencil in the switch, thereby breaking the

ground connection of the spring *h* and forcing it into contact with the spring *g*. It will be seen by an inspection of Fig. 6 that the short springs *d*, *d'*, *b*, *b'*, are connected to the same generator. Since these springs lead to both lines it will be apparent that in shifting the key in either direction stations on both lines may be rung. This provides a ready means for quickly calling the subscribers or giving a general alarm and is particularly adaptable for use on rural lines. Only one pencil switch is to be used for each operator's position.

In Fig. 7 I have shown a combined ringing and listening key. This key is somewhat similar in construction to the one shown in Fig. 1 and there is an additional set of contacts for listening in. These additional contacts are denoted in the figure by *h* and *m* and *p* and *q*. It will be observed that the contact springs *p* and *q* are shown in the figure in the same plane with the indicating spring 13 merely for the sake of convenience. In reality these springs are side by side with the retaining spring 13 and are acted upon by the same roller 9. Likewise the indicating spring 12 is at the side of and behind the springs *h* *m* being acted upon by the same roller 8. All of these springs are held between the retaining plates 16 as shown in Fig. 1. The positions of the handle 3 of the key are indicated at *r*, *r'* and *r''*, and at *s*, *s'* and *s''*. The indicating springs 12 and 13 have arc-shaped portions 14 and 14' and 15 and 15' respectively. The contact springs *a*, *b*, *c*, *d*, are arranged similarly to those shown in Fig. 1.

In practice the combined ringing and listening key is connected up in the following manner: The spring *h* is connected to one side of the operator's set, *m* is connected to the mate of *a*—i. e., *a'*, *q* to the other side of the operator's set, and *p* is connected to *a*.

The operation of the combined ringing and listening key is as follows: Normally the handle 3 of the key is either in the position *s'* or *r'* being returned to either of these positions by the action of the indicating springs 12 or 13. The roller 9 will then rest in the arc-shaped portion 15 of the spring 13 or the roller 8 will rest in the arc-shaped portion 14 of the spring 12. In either of these positions all of the springs are in their normal positions. When a call comes in the operator moves the handle up to the position *r* or *s*. If for instance the handle was in the position *s'* she would move it to *s*. When the handle of the key is at any position between *r* and *s* the rollers 8 and 9 effect the closing of the contact springs *h* and *m* and *p* and *q*. This connects the operator's set across the cord circuit. When the operator learns the wants of the subscriber and must ring the party wanted by moving the lever to the right

she must move the lever until the point s^2 is reached. The roller 9 thereupon engages the spring a and the ring is accomplished in the same manner as shown in Fig. 1.

5 It should be stated that the parts of the listening and indicating springs indicated at v in the drawings are arranged on an arc whose center is the pivot pin 2 of the key. Therefore the passage of a roller over the
10 arc shaped portion produces no movement of the spring.

In Fig. 8 I have shown a key designed to take the place of the ordinary double ringing key that is furnished with many mag-
15 neto switchboards. In this figure I have indicated only so much of the circuits as will be necessary for an understanding of the operation of the key. The circuits used are all standard in every way. This key
20 has two indicating positions on each side shown at t , t' , u and u' respectively. This key comprises the contact springs a^x , b^x , c^x , d^x , e^x , f^x , the indicating springs n^x and m^x and the listening springs g^x , h^x , k^x , and p^x .
25 The connections of the above mentioned springs are as follows: g^x is connected to the operator's set, h^x is connected with a^x , a^x is connected with one side of the clearing out drop D^x and to f^x , b^x is connected to
30 one side of the plug P^x , c^x to d^x , e^x to one side of plug $P^{x'}$, k^x to the other side of the clearing out drop and to the mate to f^x and to the mate to a^x . The other side of the cord plugs P^x and $P^{x'}$ are connected to
35 the mate to b^x and the mate to e^x respectively.

In order to ring on one plug the handle of the key must point to the indicating position t' and to ring on the other plug it must
40 point to u' . The indicating spring n^x and m^x will not allow the lever handle either to remain at u' or t' but will bring it back to u or t . The listening in position of the handle is a vertical one. When the handle
45 is in this position the rollers 8 and 9 bear against the projections s^x and v^x of the springs h^x and k^x forcing them against the springs p^x and g^x and completing the connection of the operator's set with the cord
50 circuit. Obviously this key could be made to remain in the four positions shown in Fig. 7. This modification would require listening and indicating springs shaped like those in Fig. 7.

55 Referring now to Fig. 9 I have shown therein another form of key which employs only one roller and there are no indicating springs required. The key shown in Fig. 9 is a two-way ringing and listening key that
60 rings on both of the plugs. In this key the listening springs act also as indicating springs. The key consists of the following parts: the springs a^y , b^y , c^y , d^y , e^y , f^y and g^y . The two latter together with their mates
65 $f^{y'}$ and $g^{y'}$ are the listening springs. A stop

s^y is provided for limiting the motion of the spring f^y . The springs a^y and e^y are connected to the generator. b^y is connected to one side of the plug P^y the other side of the plug being connected to the mate to
70 b^y , *i. e.* $b^{y'}$. The middle spring c^y is connected to one side of the winding of the clearing out drop and also to the spring f^y . The spring d^y is connected to one side of plug $P^{y'}$ the other side of the plug being
75 connected to the mate to e^y , *i. e.* to $e^{y'}$. The listening springs f^y and $f^{y'}$ are prolonged and have arc-shaped portions 50 and 60 constituting resistances for the engagement of the roller 100 for retaining the handle 3
80 in an indicating position. When the key stands vertically the operator's set is connected across the cord circuit through the medium of the springs f^y and g^y and their mates $f^{y'}$ and $g^{y'}$, their respective contacts
85 70 and 70' being closed. Now by moving the handle 3 a little either to the left or to the right the listening spring f^y drops down over the roller at 50 or 60 and retains the latter in an indicating position but does not
90 break the contact at 70 or 70' with the spring g^y or $g^{y'}$. Now by moving the lever a trifle more in either direction the roller arrives at the curved portions 80 or 90 of the springs b^y or d^y . This allows the listen-
95 ing springs f^y and $f^{y'}$ to drop down against the stop s^y and to break their contacts at 70 and 70'. Now by moving the lever still farther in either direction the ringing con-
100 tacts a^y and b^y or d^y and e^y are closed and the subscriber may be rung up. The tension of the ringing springs is sufficient to restore the key to its indicating position. I have shown only half of the springs but it will be understood that their mates are
105 precisely of the same construction.

In Fig. 10 I have shown a form of key which is in every respect the equivalent of that illustrated in Figs. 1 and 2, for use in the circuit of Fig. 6, and which in many
110 cases I consider the preferable specific form. The relation of the several contact springs is the same, and they are lettered the same as in Figs. 1 and 2, but instead of having a pair of rollers 8 and 9 carried on the ends of
115 forked arms, I prefer to use a single roller 100, and in order that this may work the spring a or a' the same as the double rollers would do, I provide extension arms at any suitable point on the two springs a and e , or
120 a' e' . The same form of holding and listening spring is shown and may be used which is shown in Fig. 9, and which has already been described. When the handle 3 is thrown one way or the other, the roller 100
125 engages the projections on the springs, 300 or 310, as the case may be, and the same effects are produced as with the key of Fig. 1, except that the normally closed contacts of
130 springs a and e , and the insulating piece

m^z are reversed in their positions. This key of Figs. 1, 2 and 10 is particularly well adapted for eight party line ringing, and for general alarm ringing. In the latter it is always associated with a pencil switch, as shown in Fig. 3, the same being a part of the complete organization for such ringing.

It will be understood that while the double roller principle herein set forth can be used for two way ringing, as already pointed out, its most important function, and the function which links together the different species described herein, including the pencil switch, is that of ringing as shown in Fig. 6. My claims will be drawn accordingly.

Fig. 11 is a detail view showing one manner in which the springs of the key in Fig. 10 may be constructed. This, and other mechanical details are subject of course to variation, their presentation being by way of definition and explanation only, and not for purposes of limitation as to form or scope of the claims. In order to form the projections 300 and 310, if the springs are blanked out as shown in Fig. 11, they will be bent on the lines 350 and 360.

Having thus described my invention what I claim and desire to secure by Letters Patent of the United States is—

1. In a telephone exchange system, an operator's ringing outfit comprising the following instrumentalities: a cord circuit and plug, a plurality of selective keys or switches individually connected to ringing generators of different characteristics, and jointly connected to a common ringing wire, a master key adapted to connect the common ringing wire to the cord circuit, and a supplemental key adapted when actuated to signal more than one station at the same time.

2. In a telephone exchange system an operator's ringing outfit comprising the following instrumentalities: a cord circuit and plug, a master key, a plurality of selective switches or keys, and means whereby the master key after selection may apply the selective ringing current to either side of the cord.

3. In a telephone exchange system an operator's ringing outfit comprising the following instrumentalities: a cord circuit and plug, a common ringing wire, a plurality of selective keys or switches for the same, a master key controlling the connection of the ringing wire to the cord, and a supplemental key adapted to determine whether one or a plurality of stations shall be rung.

4. In a telephone exchange system an operator's ringing outfit comprising the following instrumentalities: a two conductor cord circuit with a terminal plug, a master key having contacts reversely arranged in the two sides of the cord, means to connect any one or more of a plurality of ringing sources to said key, and means to operate

the key so as to open both sides of the cord and connect said generator or generators to either side thereof at will.

5. In a telephone exchange system, a line circuit with a plurality of stations thereon each containing a telephone talking set and a signal receiving device, means for effecting connection with said line at a central station, and selective signaling means with an associated master key controlled by an operator to actuate any one or a plurality of said sub-station devices simultaneously without interference in either case.

6. In a telephone exchange system, a line circuit having a plurality of stations connected thereto, each containing a telephone talking set and a signal receiving device, means for effecting connection with said line at a central station, a master key with selective means whereby one or more generators may be connected to one side of the line, and a supplemental key associated therewith whereby the generator or generators may be connected to the other side of the line.

7. In a telephone exchange system, subscribers' lines each having a plurality of sub-stations connected to it, a talking set and a ringer at each sub-station, said ringers adapted to be selectively actuated, a cord circuit and plugs for interconnecting the lines, both lines and cord being full metallic, and an operator's ringing outfit comprising the following instrumentalities: a plurality of generator connections, a plurality of selective switches or keys between the same and a common ringing wire, a master key adapted to open both sides of the cord when operated in either direction, with springs arranged so that when operated in one direction they will connect the ringing wire to one side of the calling end of the cord, and when operated in the other direction, to the other side thereof, and a supplemental switch normally grounding the side opposite the generator, but adapted when actuated to cut off the ground and connect the generator to both sides of the master key, by which it is connected to both sides of line.

8. In a telephone exchange system, a subscriber's line, a cord-circuit for interconnecting the lines, and a ringing key having two pairs of master springs, each pair adapted for inclusion in one side of the cord circuit, a ground and a generator contact associated with one spring of each pair, and means common to both pairs adapted to separate them and connect the corresponding springs of the two pairs with ground and generator, respectively, or vice versa.

9. In a telephone exchange system, a subscriber's line having several stations with ground taps from opposite sides of the line containing ringers, means for effecting connection with said line, and a ringing key

having two pair of master springs, a ground and a generator contact associated with one spring of each pair, an extension on each spring of the pair, and a key lever acting
 5 on both pairs simultaneously to separate them and connect corresponding springs with ground and generator, respectively, or vice versa.

10 10. In a telephone exchange system, a subscriber's line with a plurality of stations having individual ringers adapted for selective actuation, means for effecting connection with the line, and a ringing key comprising a straight spring and a parallel
 15 coöperating spring having its end returned to form a yoke straddling the top of the straight spring, whereby it may engage the same upon opposite sides, a pair of opposite coöperating contacts for the straight spring,
 20 and means to move the yoke spring in opposite directions at will.

11. In a telephone exchange system, a subscriber's line with a plurality of stations having individual ringers adapted for se-
 25 lective actuation, means for effecting connection with the line, and a ringing key having a straight spring, a parallel spring with its end returned to form a yoke straddling the top of the straight spring, an insulating
 30 stud on one side of the yoke adapted to engage the straight spring when the yoke is moved in one direction, and a pair of coöperating contacts on the other side of the yoke and the straight spring respectively,
 35 together with additional contacts controlled by the straight spring in its movement.

12. In a party-line telephone system, a subscriber's line with a plurality of stations
 40 to, means for effecting connection with said

line, and a ringing key outfit comprising a selective and master key, operating means therefor, and a supplemental switch comprising a set of springs, a frame carrying the same and secured to an escutcheon, an
 45 opening in said escutcheon, and means operable through the opening for actuating said springs, said supplemental switch adapted to modify the ringing effect of the master key.

13. A ringing key outfit comprising a selective and master key, operating means therefor, and a supplemental or shifting key comprising a frame and a set of springs
 55 thereon, a tube supported on said frame parallel to the springs, a lever extending into the tube, actuating means on said lever engaging the springs, and means whereby said lever may be depressed in the tube by
 60 a lead pencil or similar article.

14. A ringing key outfit, comprising a selective and master key, operating means therefor, and a supplemental switch associated therewith comprising a cylindrical
 65 socket with an opening in one side, a pivoted lever having a button on one end and an insulating roller on the other, spring contacts associated with said lever, the button end thereof extending into the socket,
 70 and the roller end engaging the spring, whereby on the insertion of an article into the socket to depress the button, the spring will be actuated.

In testimony whereof I affix my signature in presence of two witnesses.

ELBERT R. HOBBS.

Witnesses:

R. H. Cost,
 GEO. L. LAYNE.