

(No Model.)

5 Sheets—Sheet 1.

G. L. ANDERS.
TELEPHONE SYSTEM.

No. 500,545.

Patented July 4, 1893.

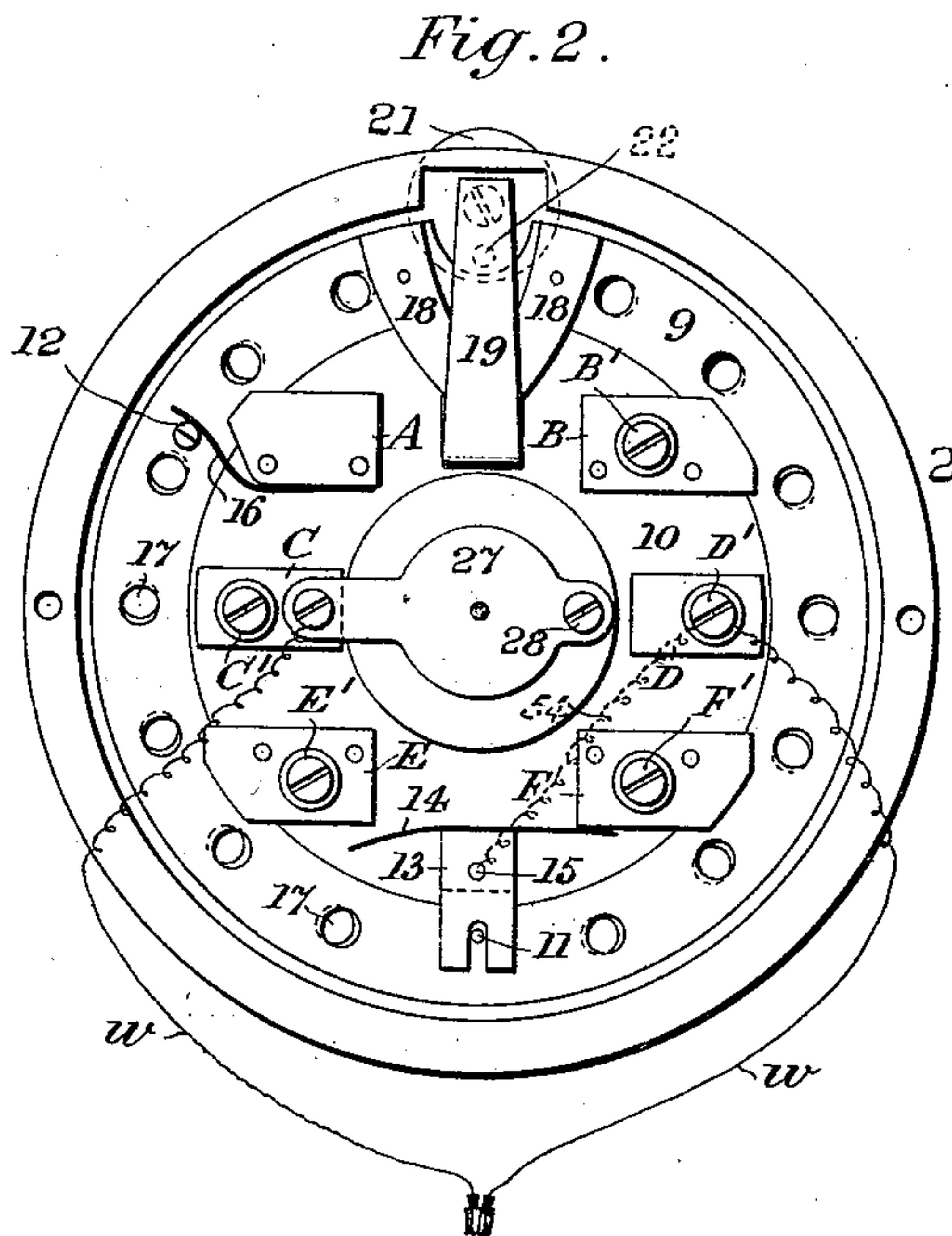
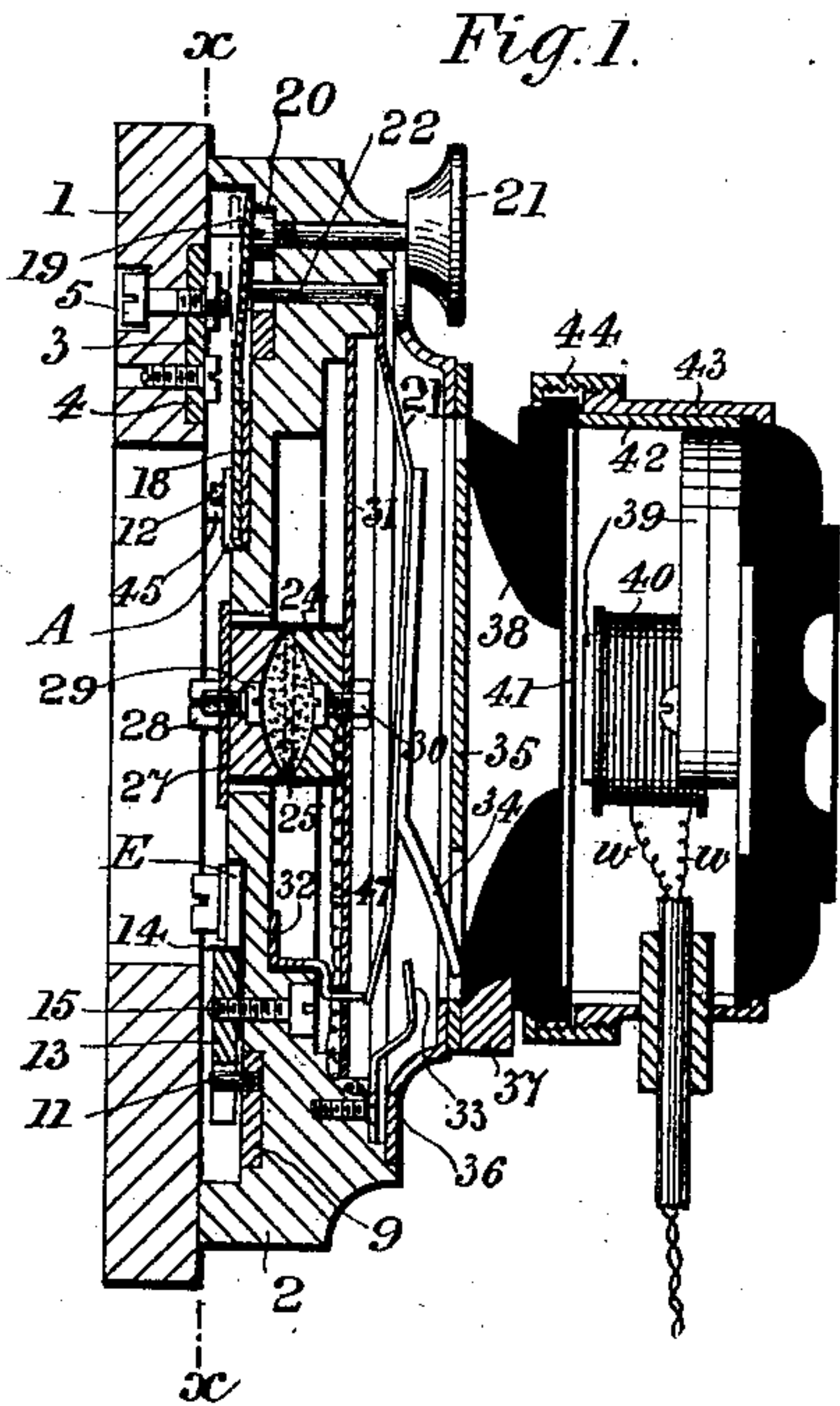


Fig. 3.

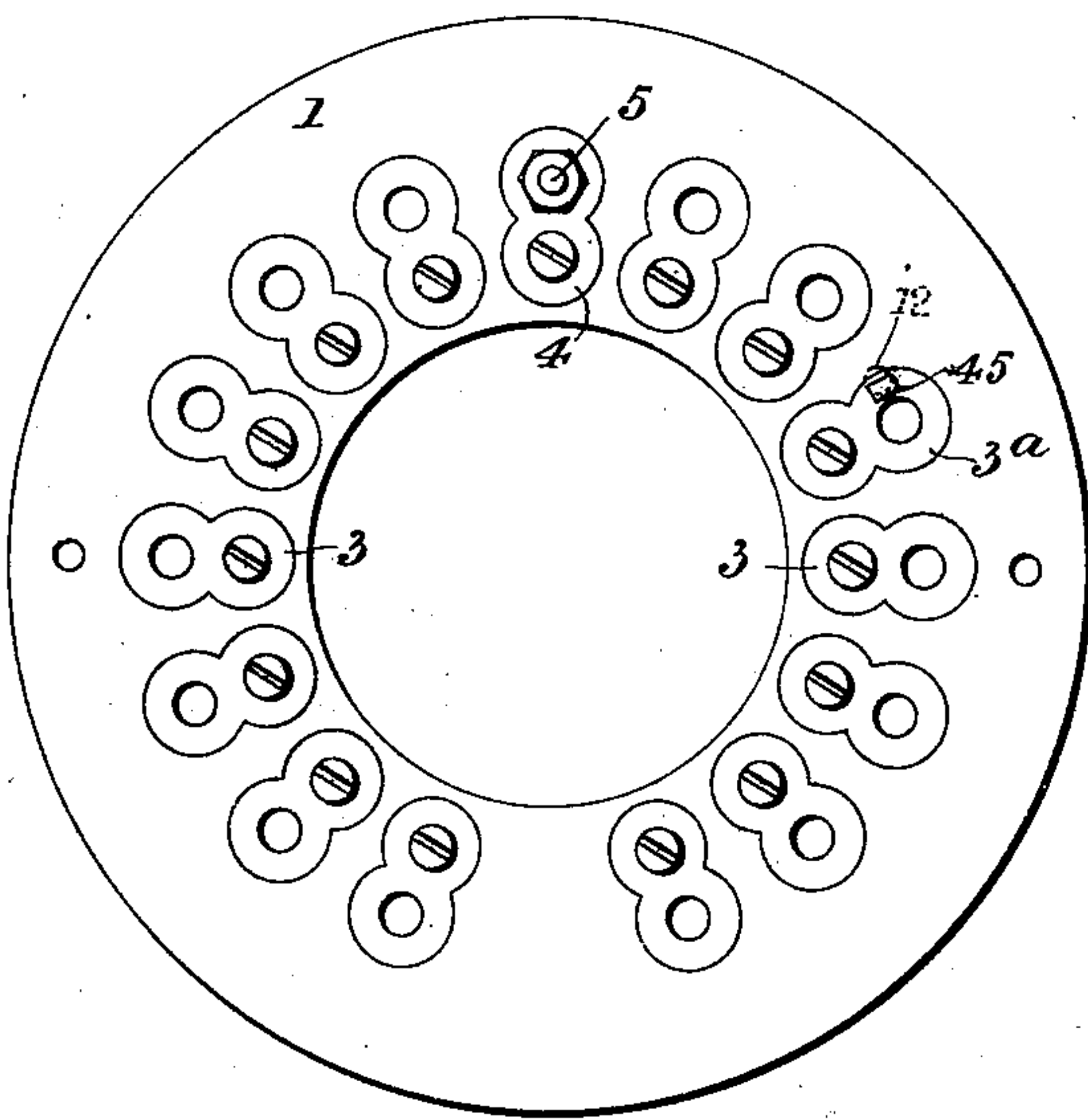
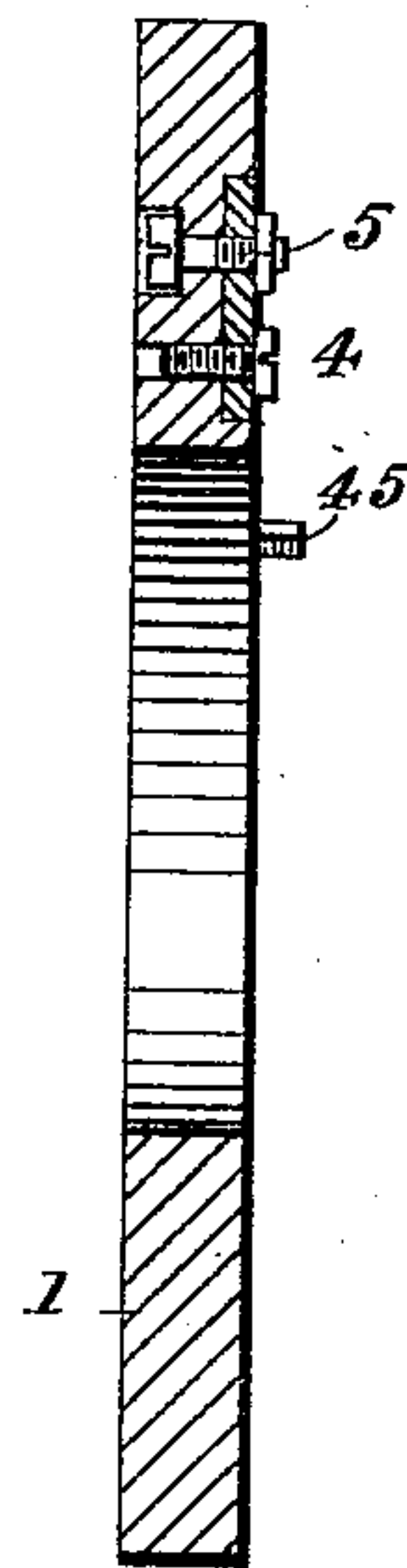


Fig. 4.



Witnesses.
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Fig. 5.

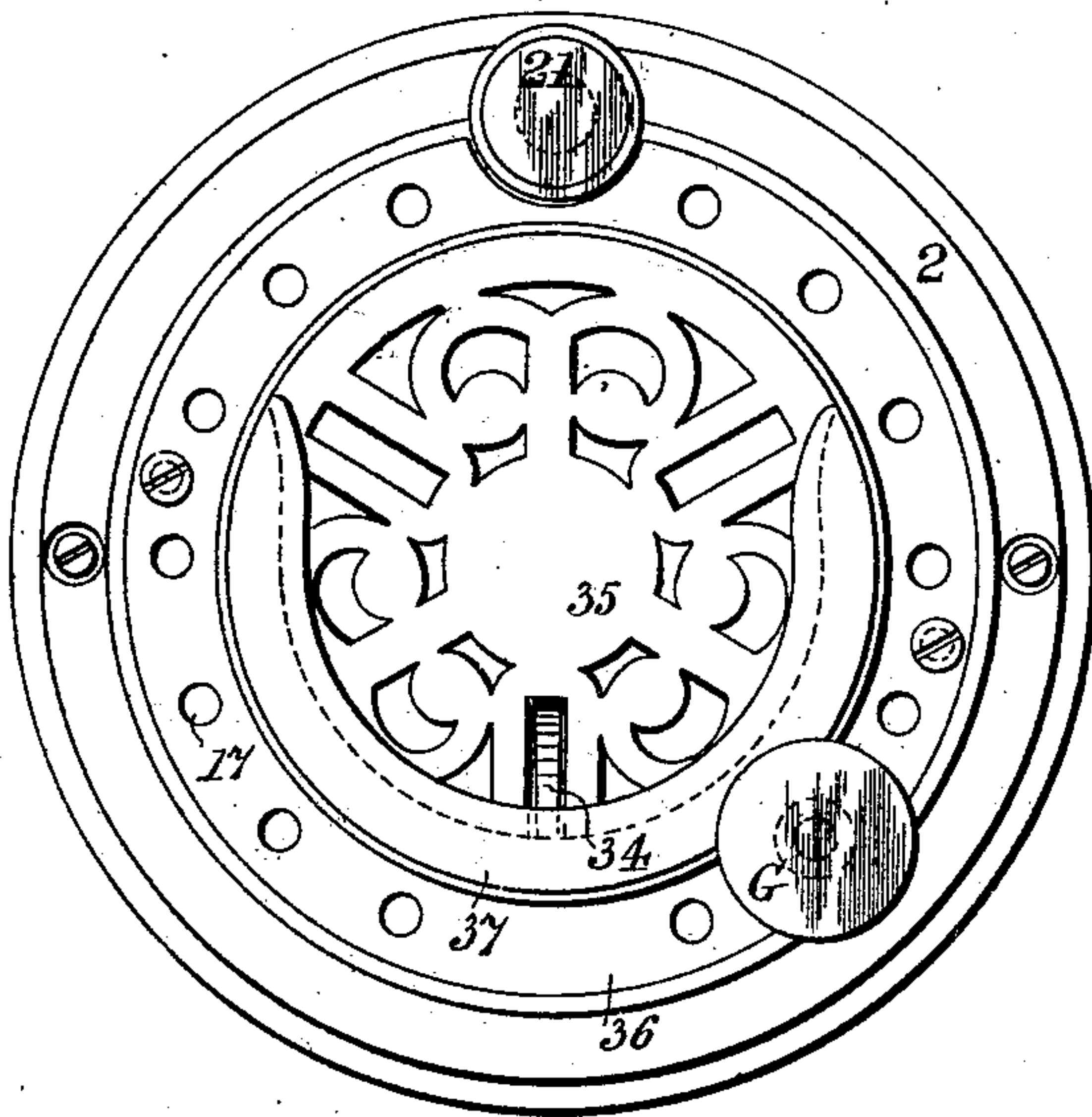


Fig. 6.

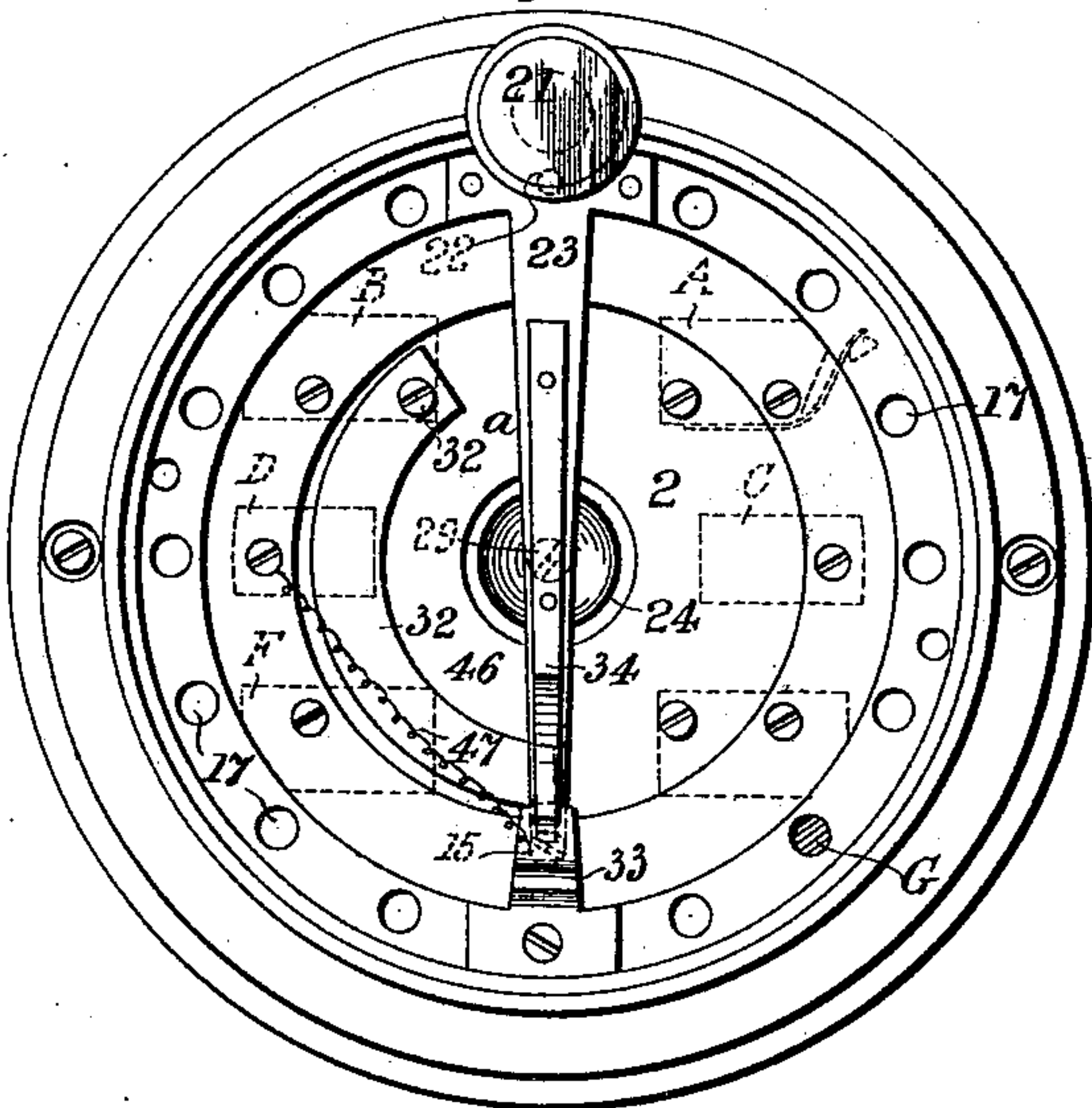


Fig. 7.

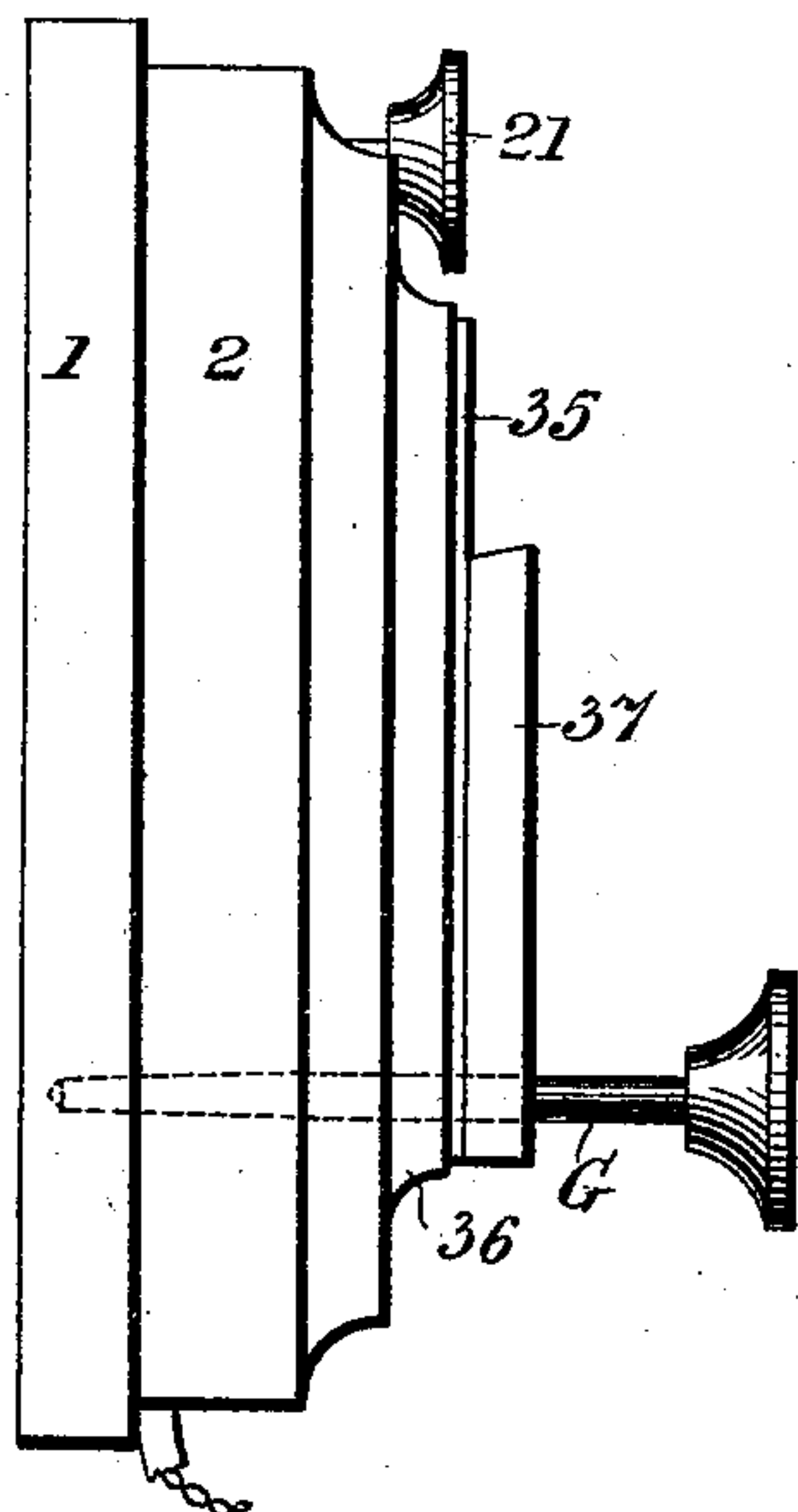


Fig. 8.

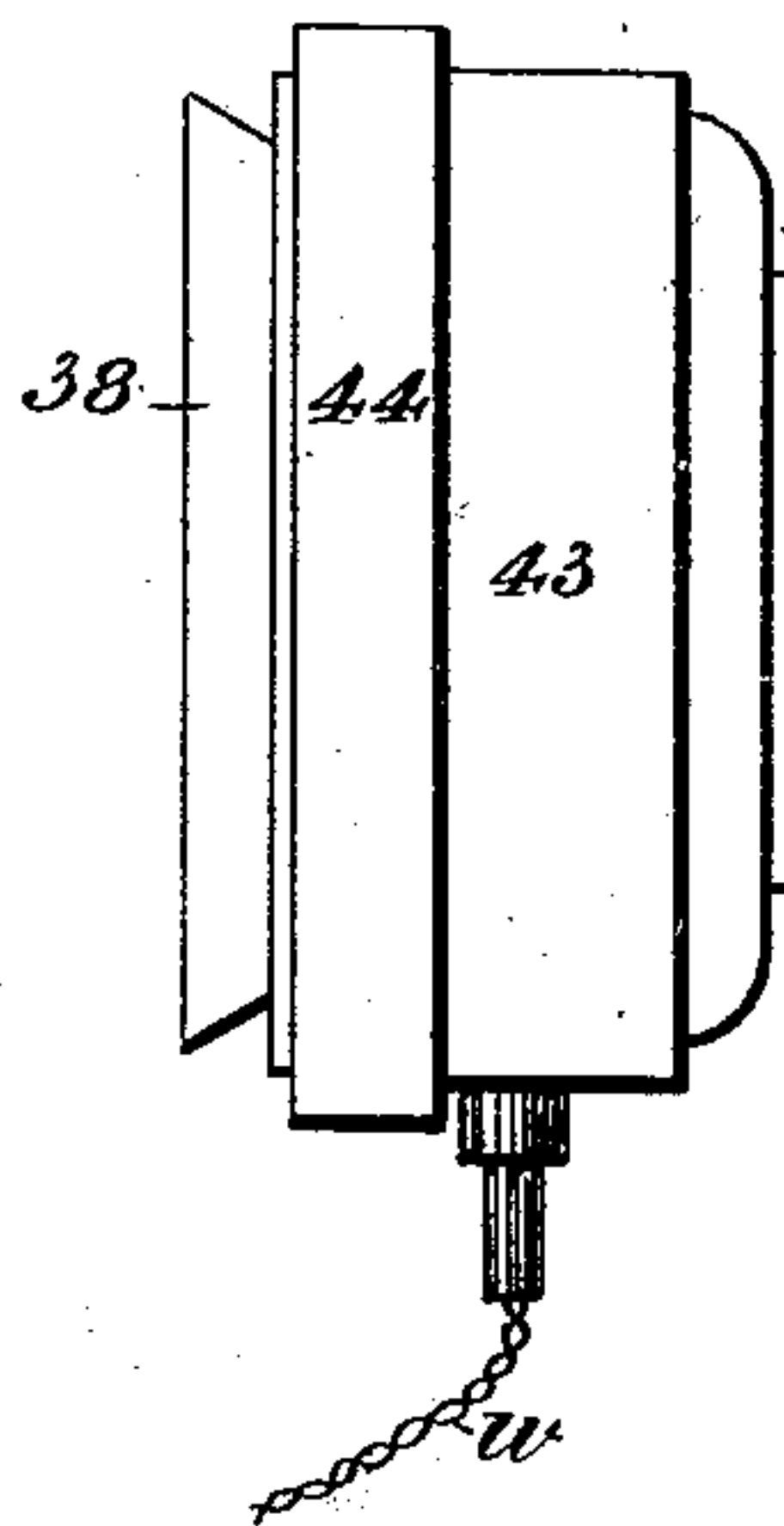


Fig. 9.

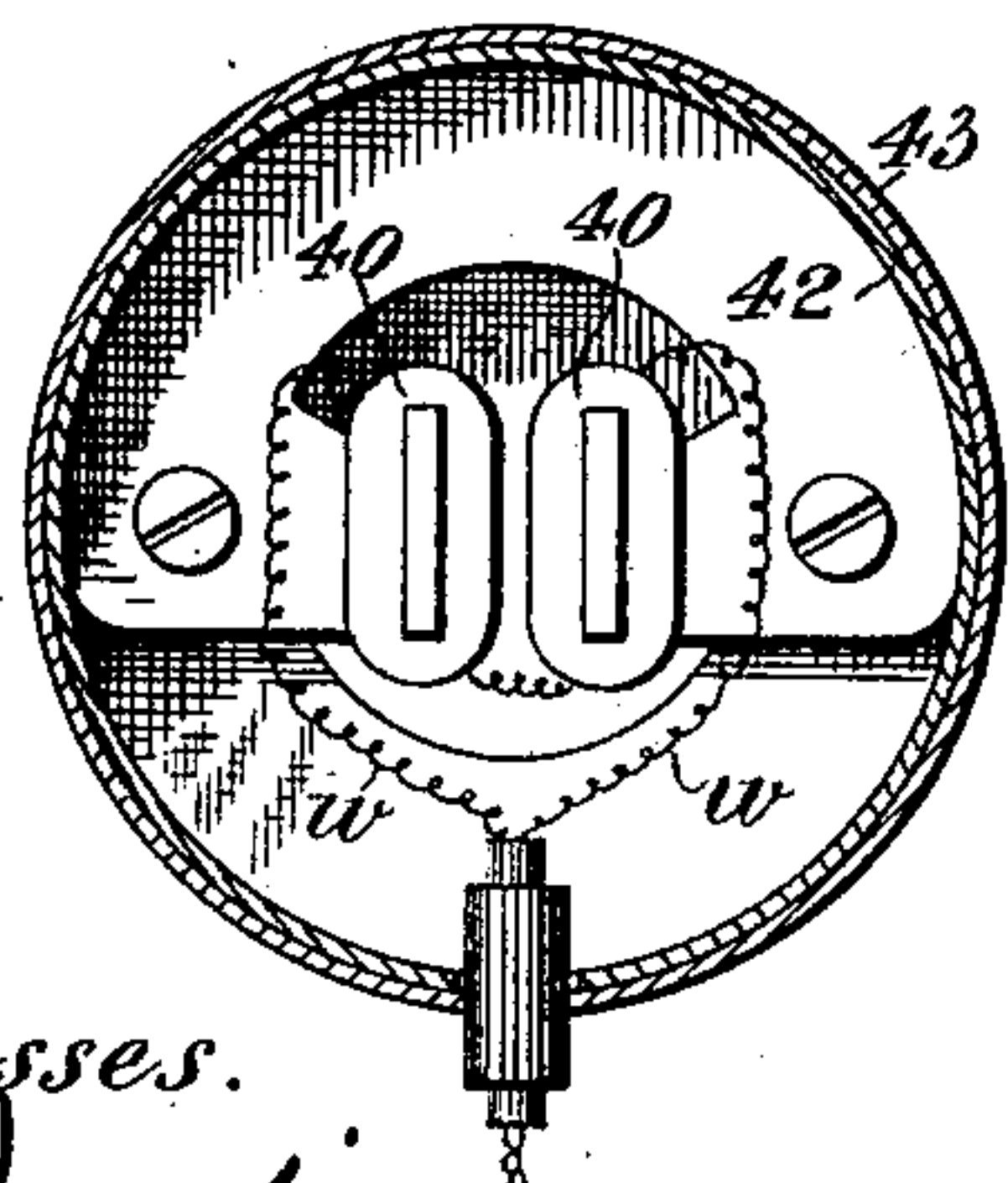
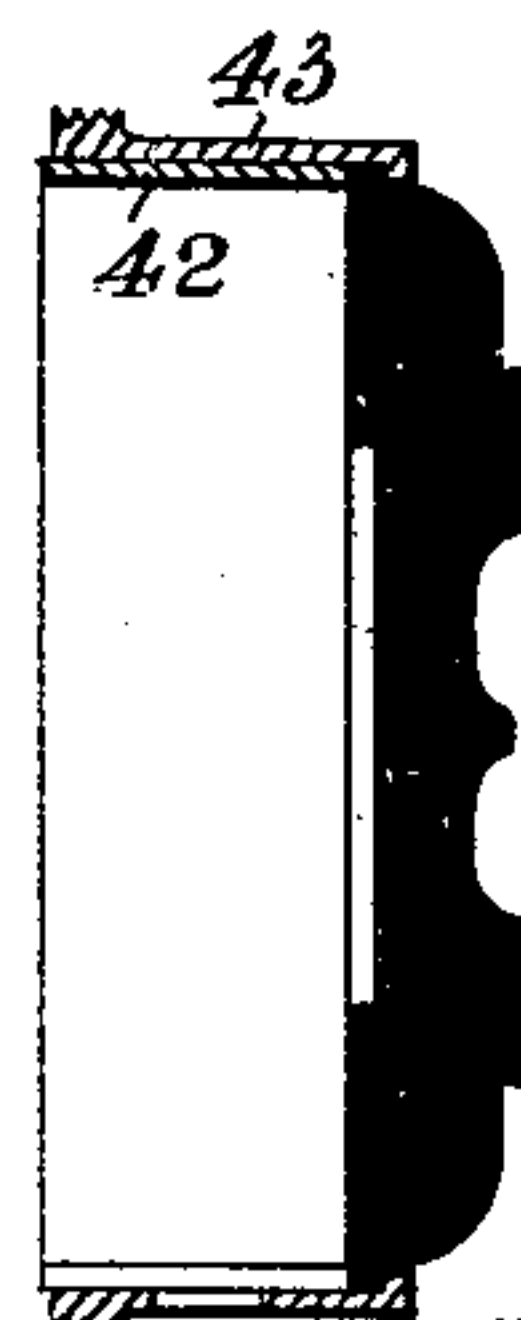


Fig. 10.



Witnesses.

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(No Model.)

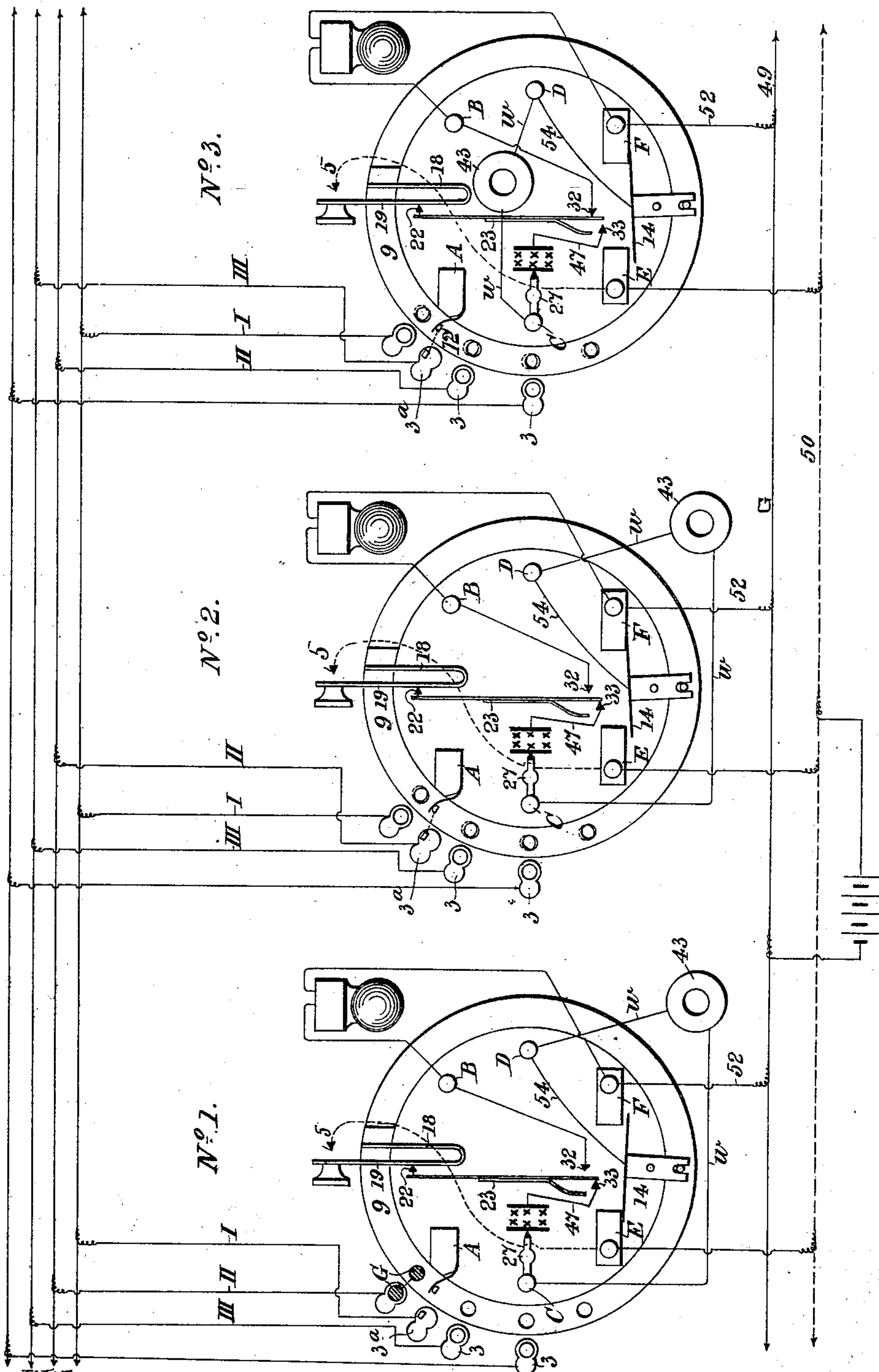
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Fig. 11.



Witnesses..

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(No Model.)

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Fig. 12.

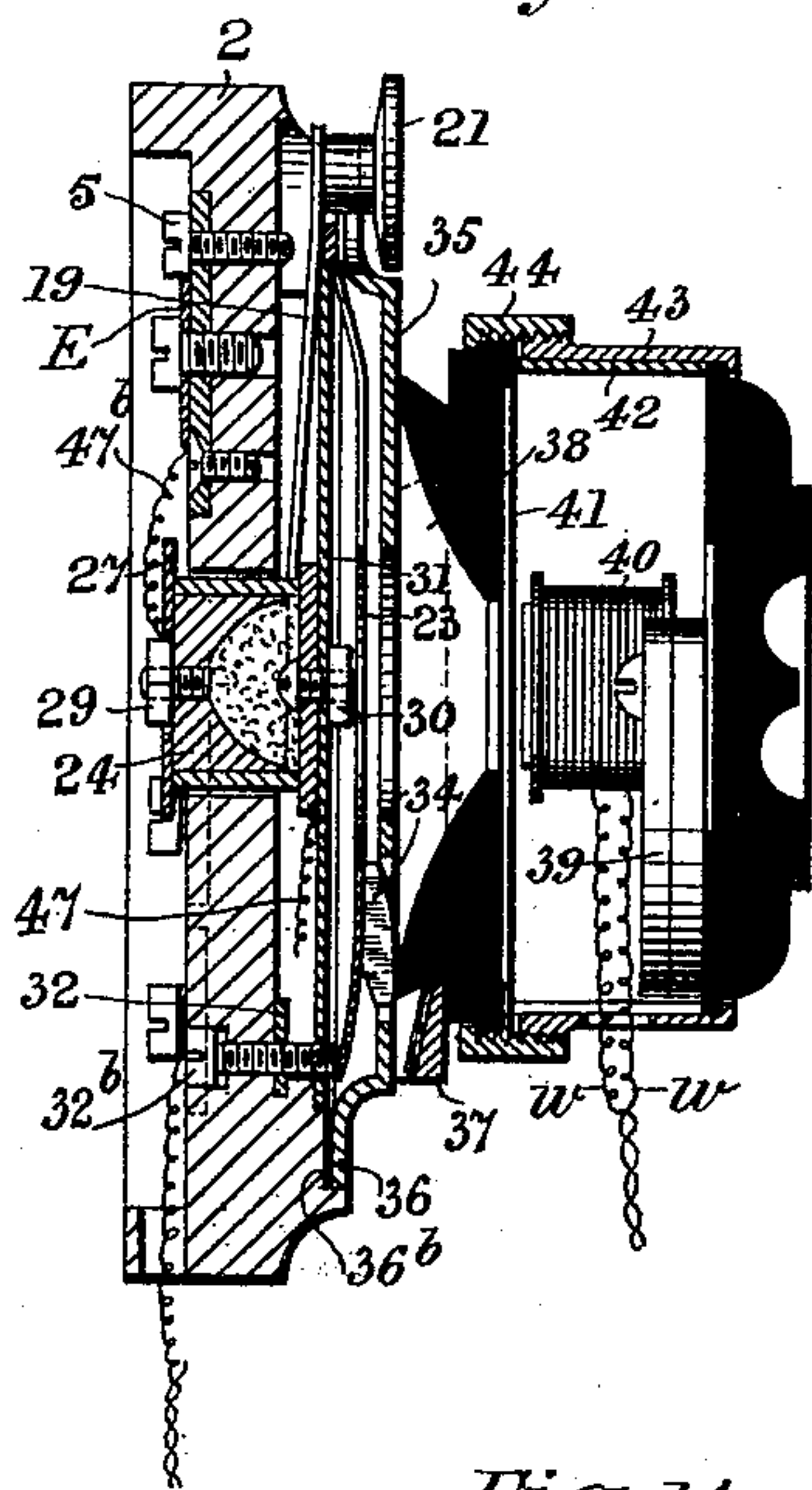


Fig. 13.

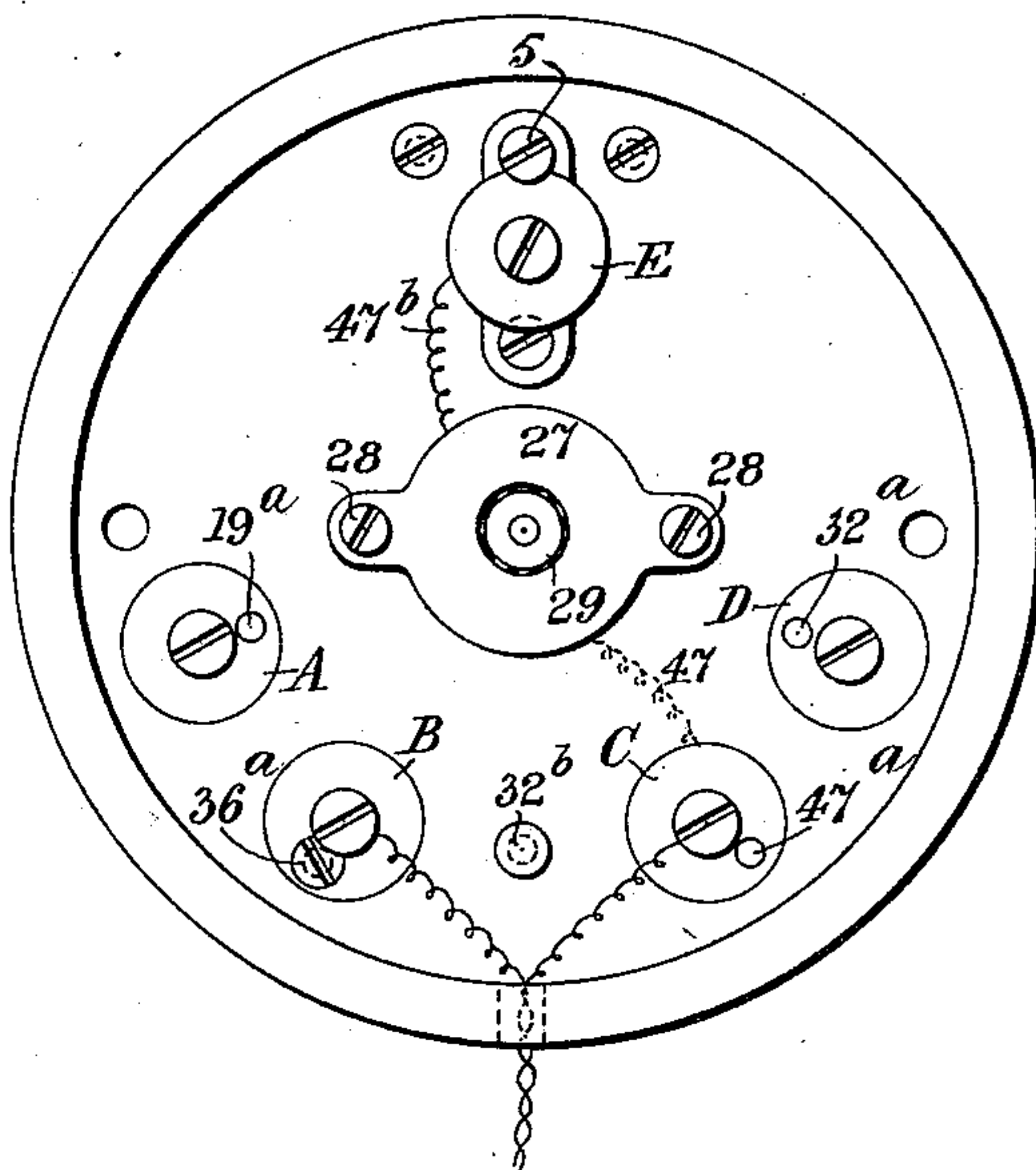


Fig. 14.

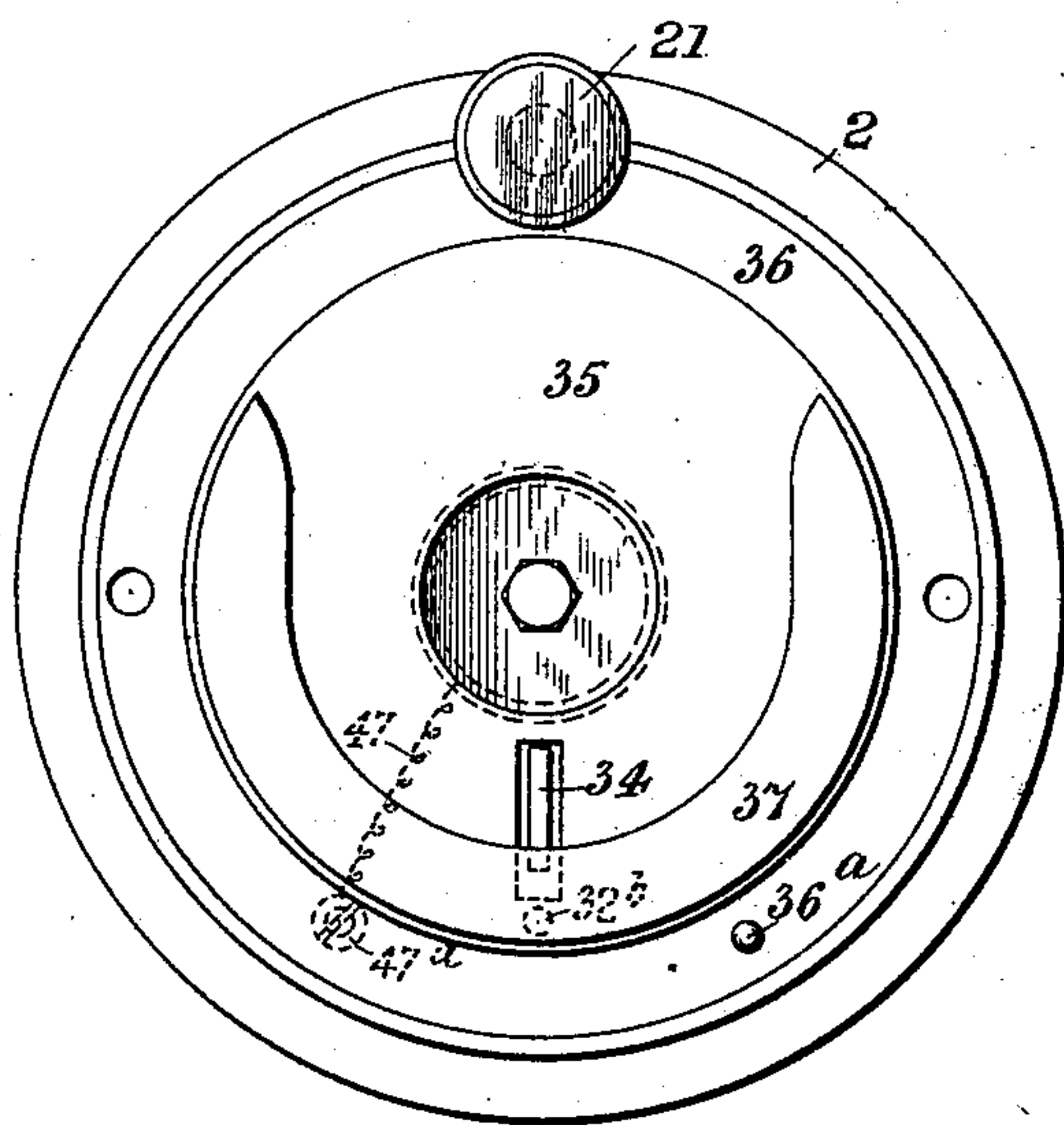
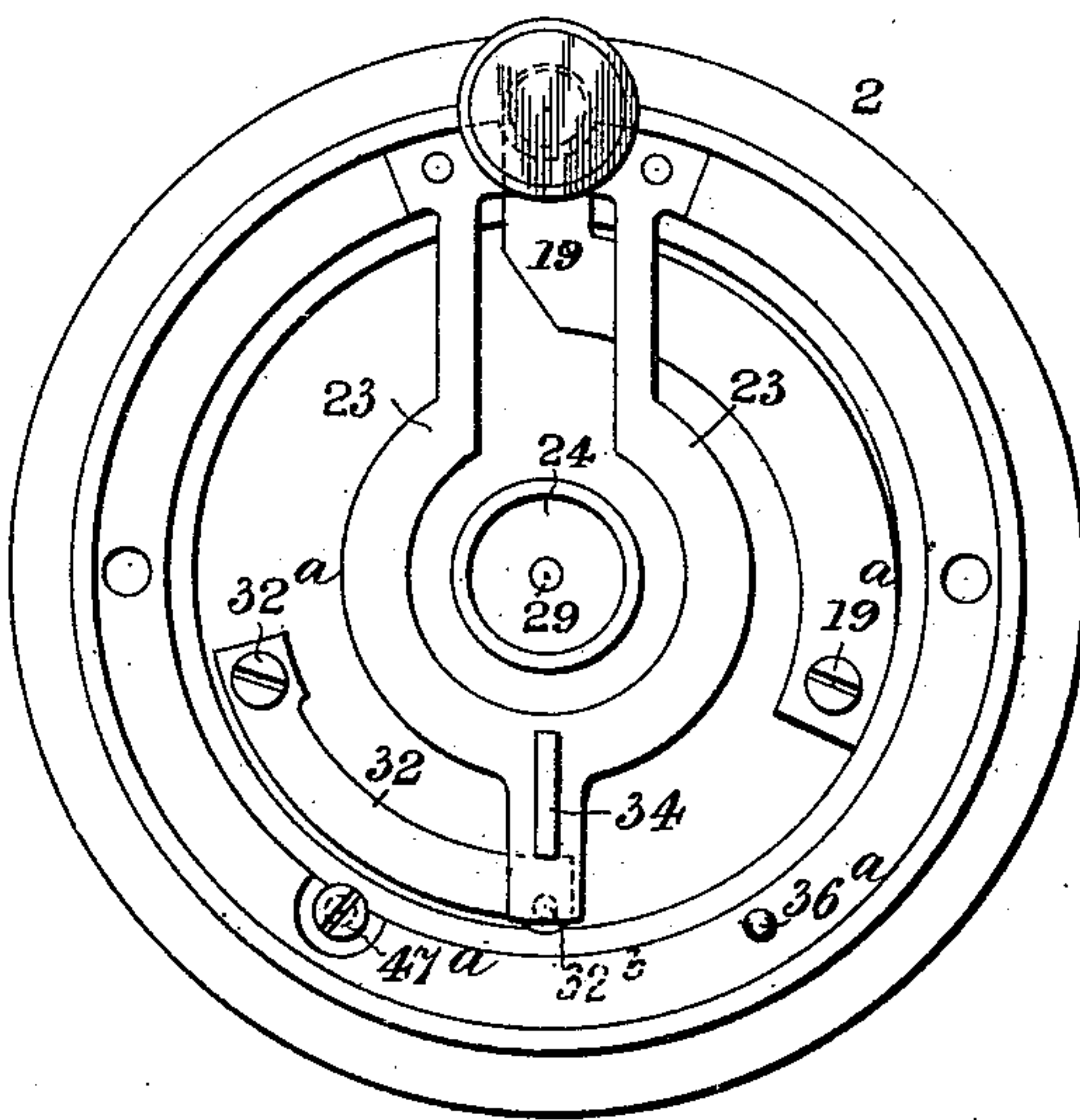


Fig. 15.



Witnesses.

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George L. Anders

(No Model.)

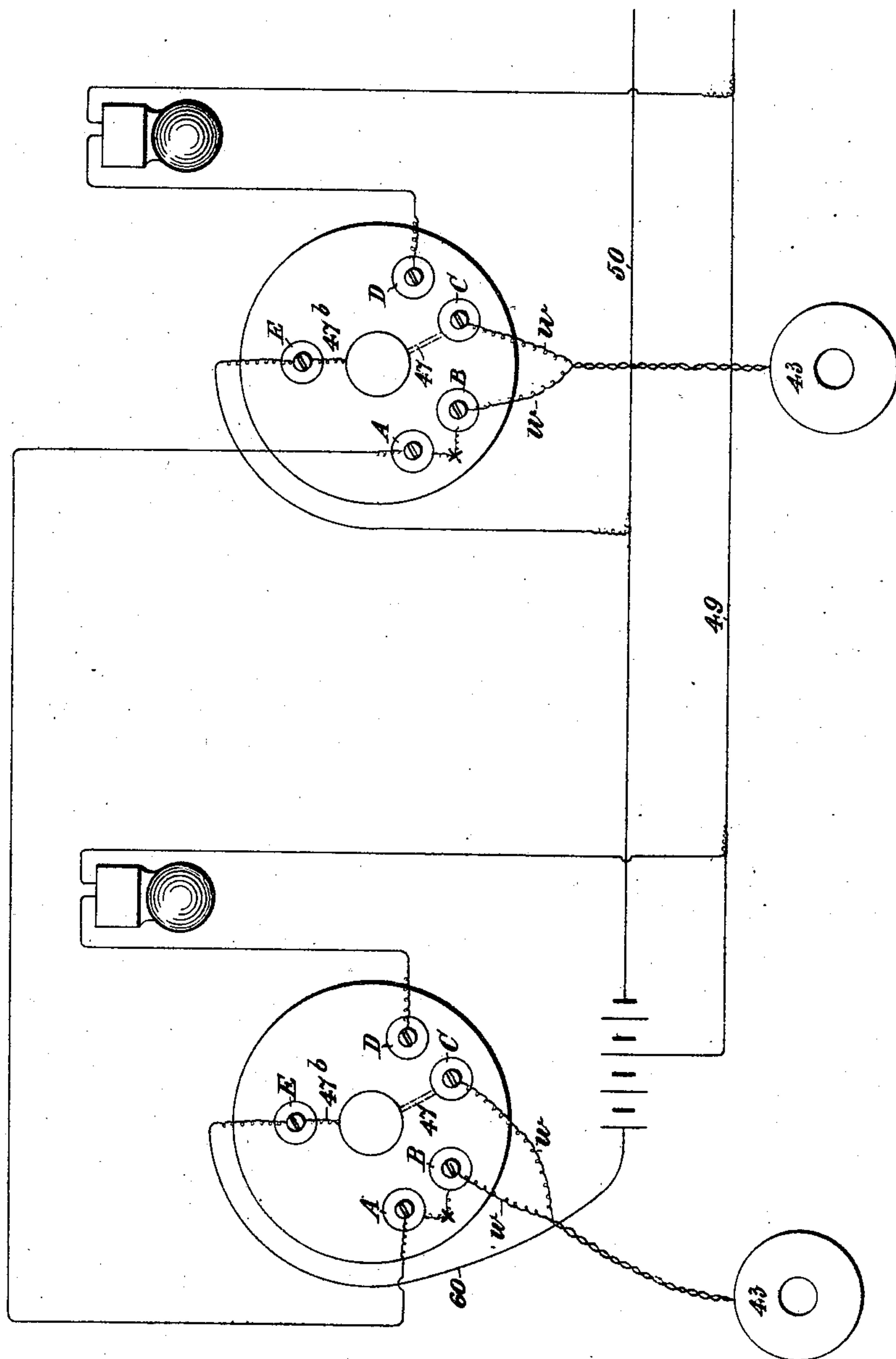
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Fig. 16.



Witnesses.
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UNITED STATES PATENT OFFICE.

GEORGE LEE ANDERS, OF LONDON, ENGLAND, ASSIGNOR OF THREE-FOURTHS
TO WALTHER KÖTTGEN, OF SAME PLACE.

TELEPHONE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 500,545, dated July 4, 1893.

Application filed December 1, 1892. Serial No. 453,763. (No model.)

To all whom it may concern:

Be it known that I, GEORGE LEE ANDERS, a subject of the Queen of Great Britain, residing at Sydenham, London, in the county of Kent, England, have invented certain new and useful Improvements in and Connected with Telephones, of which the following is a specification.

My invention relates to improved telephonic apparatus consisting of a combined telephone transmitter, receiver, ringing key and switchboard, such an apparatus being adapted more particularly for domestic use such as in hotels or large buildings where it is desirable that an individual in an office or bureau may be able to communicate with a number of rooms or departments, the switchboard which is combined with the apparatus being provided for this purpose. Such switchboard is operated by means of a plug which is placed by the person wishing to make communication in one of a number of holes arranged around the instrument. The apparatus is however adapted for other more extended or public uses when in connection with other apparatus of the same construction as will be evident from its construction and operation which are hereinafter described.

My invention also relates to a modified form of instrument without the switchboard as hereinafter described.

In the accompanying drawings Figure 1 is a vertical section through the combined apparatus. Fig. 2 is a view of the back on the line $x-x$ Fig. 1 looking to the left the base or switchboard being removed. Fig. 3 is a view of the switchboard on the line $x-x$ Fig. 1 looking to the right. Fig. 4 is a vertical section through the switchboard. Fig. 5 is a front view of the apparatus with the receiver and ringing-key removed. Fig. 6 is also a front view, but showing the front plate and transmitter diaphragm removed in addition to the receiver and ringing key. Fig. 7 is a side elevation of the transmitter and switchboard portion of the apparatus. Fig. 8 is a side elevation of the receiver removed from the transmitter. Fig. 9 is a front view of the receiver with the mouthpiece diaphragm and holding ring removed. Fig. 10 is a side sectional elevation of the receiver case without

the mouthpiece diaphragm, holding ring or magnets. Fig. 11 is a diagram showing the circuits through three instruments constructed in accordance with the above. Fig. 12 is a sectional elevation of a modified form of transmitter with the receiver in place. Fig. 13 is a back view of the modified transmitter. Fig. 14 is a front view with the receiver removed. Fig. 15 is a front view with the receiver and cover plate removed and Fig. 16 is a diagram illustrating the circuits between two instruments of this type.

The base 1 of the apparatus which is of vulcanite forms the part which I term the switchboard. To this base is attached by suitable screws (not shown) the main body 2 of the apparatus which is of insulating material. The switchboard has a number of brass plates 3 arranged in a circle and sunk therein. As shown there are fourteen of these plates 3 having holes therein for the reception of a plug and one plate 4 which carries a projecting stud 5. One of the plates 3^a carries a stud 45. The arrangement shown enables the user of the instrument to communicate with fourteen different persons or departments as each of the plates 3 is in electrical connection with a wire passing to the instrument of such persons or departments. The back of the body 2 Fig. 2 has a brass ring 9 sunk into the wood flush with the surface 10 on which latter are six brass blocks A. B. C. D. E. F. The ring 9 has fourteen holes therein which correspond to those in the plates 3 and carries also projecting studs 11 and 12. On the surface 10 is pivoted a block 13 of insulating material such block having a slot with which the stud 11 engages and carrying a metal strip 14 such strip having a portion turned down beneath the block 13 as shown in Fig. 1 so as to make electrical contact with the pivot screw 15. The stud 12 has a constant pressure placed upon it by means of a spring 16 attached to the block A which acts to cause the ring 9 to be held in the groove of the body 2 in which it is sunk, in such a position that the pin 11 keeps the pivoted block 13 pressed over so that the right hand side of the strip 14 (looking at Fig. 2) is normally in contact with the block F. By this means the ring 9 it will be seen is held so that the holes in same are out

of line with a similar number of holes 17 in the body 2. When however a plug such as G is inserted in the holes in the instrument the effect will be to cause the holes in the ring 9 to be brought into line with the holes 17 so that such ring will be shifted, the block 13 will be rocked and one end of the strip 14 will be removed from contact with the block F and the other end will be brought into contact with the block E, the spring 16 returning the ring when the plug is withdrawn. The strip 14 is always in contact with the block D by means of a wire 54 shown in Fig. 2.

The ring 9 has riveted to it and in electrical contact therewith a forked strip 18 the long arm or piece 19 of which is bent over as shown in Figs. 1 and 2 and forms one of the contact pieces of the ringing key such piece 19 being acted on by the head 20 of the push button 21, which when operated will force the piece 19 into contact with the stud 5 and complete the battery circuit for ringing a distant bell. The piece 19 is of course moved with the ring but is sufficiently wide not to entirely pass the pressing head 20 when the ring is moved.

The ring 9 is cut away beneath the piece 19 to permit of a stud 22 passing through same without being in contact therewith such stud 22 being in contact with the underside of the strip 19 except where the latter is operated by the push button 21. The other end of the stud 22 is attached to the base of a spring switch strip 23 Figs. 1 and 6 on the front of the body portion 2. Through the body 2 is a central hole in which is held the transmitter microphone. This consists of two hard carbon blocks 24, 24 which are cup shaped in their interior faces between which is placed a mass of carbonized fiber 25. This is preferably a cotton fiber which before or after carbonization may be impregnated with fine carbon or plumbago. To retain this between the cup shaped faces of the carbon blocks a short piece of rubber tubing 26 is placed over the two blocks. The rear block 24 is held in the central hole of the body by means of a plate 27 one arm of which is screwed to the block C and is in electrical contact therewith while the other short arm is attached to the body 2 by a screw 28. The rear block 24 is attached to the plate 27 by a screw 29 while the front block is attached by a screw 30 to the diaphragm 31 a wire or strip 47 passing from the screw 30 to the base of a retaining piece 33. Other forms of microphones may however be employed, but I have found the carbonized fiber employed loosely in this way to be of great advantage as it is capable of being used in any position. It may be used however in various ways, but that illustrated will work well.

The blocks A. B. E. F. slightly overlap the ring 9 for the purpose of keeping it in its place the blocks B E F having a thin piece of insulating material beneath them as shown

in the case of the block E Fig. 1. The blocks C D do not overlap the ring—and the blocks B C D E F have screw terminals B' C' D' E' F' on them. The front of the body 2 is recessed as shown in Figs. 1 and 6 and on the lowest surface 46 it carries a curved metal strip 32. One end of this strip 32 is secured by a screw 32^a to the body 2 such screw making electric contact with the block B on the other side. The free end of the strip 32 is bent up to form one piece of a contact maker or switch such end projecting through an opening in the diaphragm as shown in Fig. 1. The other piece of the switch is the switch strip 23 before referred to. This strip 23 is bent as shown in Fig. 1 and passes across the face of the diaphragm its free end being in contact with the retaining piece 33 before referred to when the receiver is removed. The switch strip 23 carries on its upper surface a metal strip 34 bent up to form a nose which projects through a slot in a perforated cover plate 35. This cover plate serves to protect the diaphragm. It is secured by small screws to or may form part of the metal cover 36. This cover has a projecting yoke 37 a portion of the way around same such yoke being undercut or beveled as shown in Fig. 1 to hold the receiver, the vulcanite mouthpiece 38 of which has a correspondingly beveled flange to engage therewith. In this position it will press on the nose of the strip 34 as shown in Fig. 1, by the wedging action of the flange in the yoke and so cause the strip 23 to break contact with the retaining piece 33 and make contact with the curved strip 32. Around the flange of the cover 36 are fourteen holes corresponding to the holes 17 in the body 2.

The receiver comprises an ordinary bent magnet 39 the two ends of which are turned up to receive the bobbins 40. The magnets are secured to the back of the receiver which is of vulcanite its exterior face being a rosette or other ornamental shape. Two wires only are employed for connecting the receiver with the transmitter and these are marked *w w*, are conducted through the case of the receiver and are connected to the coils as shown in Fig. 9 their other ends being connected to the blocks C and D respectively as shown in Fig. 2.

For the purpose of keeping the diaphragm 41 of the receiver at the correct distance from the magnets I have devised the arrangement shown. This consists of a ring 42 which may be open as shown which is slipped into the case 43 and abuts against the back of the receiver, in which position it is flush with or projects slightly beyond the outer edge of the case. This ring is of a depth corresponding to the distance that the diaphragm is to be from the back of the receiver, the mouthpiece is placed on this and the parts are secured together by a clamping ring 44 one edge of which is turned over to hold the mouthpiece while the other end is threaded to en-

gage with a thread on the case 43. The arrangement described obviates the use of packing rings and like troublesome devices for obtaining and preserving the correct distance between the diaphragm and the magnets and is also a very convenient method of holding the parts together. A part of the object of the plug 21 has been previously explained that is for the purpose of shifting the ring 9 and strip 14. Its further purpose when it is placed in one of the holes on the face of the instrument (which holes are lettered, numbered or otherwise marked to indicate different persons or departments) is to make contact between the ring 9 and one of the fourteen plates on the base 1 which plates as before stated are in connection with the particular line wire desired. The effect of the entrance of the plug is to shift the ring and this shifting causes the stud 12 to be moved out of contact with the stud 45 with which it is normally in contact as indicated in Fig. 3 such contact being broken until the plug is withdrawn.

In the operation of the instrument the receiver is first removed, the plug is placed in the desired hole and the ringing key 21 is operated. The mouthpiece of the transmitter is now exposed for use and the receiver being placed to the ear communication with the desired station is established. The circuits through the instrument are as follows reference being made to the diagram Fig. 11: Supposing a current is coming into the instrument the receiver being in the transmitter mouthpiece as indicated at No. 3 station no plug being in the instrument, the path of the current is from the line wire III to the plate 3^a on the switchboard from latter to stud 45 (not shown here) which is in contact with stud 12, stud 12 to ring 9 from latter to key 19 to stud 22 through stud 22 to strip 23 from latter through strip 32 to block B out through signal bell to block F and to earth or return wire 49. To send a signal the receiver is taken out as shown at No. 1 station, the plug G is placed in the particular hole belonging to the person to be called up and the current is from battery wire 50 to block E from latter to plate 4 on switchboard from plate 4 to key 19 when depressed through strip 18 to ring 9 and from latter through the plug to the particular block connected to the wire desired as represented at No. 1 station where the plug G is illustrated as being in one of the holes and in connection with line wire II from whence it will go to station No. 2, enters by wire II and the receiver being in the instrument the circuits are as described previously in the case of No. 3 station. As shown however the receiver in No. 2 station is out as Nos. 1 and 2 are supposed to be talking as will be hereinafter described.

The foregoing illustrates the path of the current from block E to plate 4 when the key 19 is put into contact therewith so that the whole force of the battery is caused to pass

through the wires but it will be seen that there is also a circuit from plate E through strip 14 wire 54 terminal D through receiver to terminal C by plate 27 through the microphone out by strip 47 to contact piece 33 switch 23 stud 22 key 19 strip 18 ring 9 through plug to the plate on the switchboard and from that to wire II. The current by this path however passing through the receiver and transmitter may not be sufficient to ring the distant bell and it is herefore desirable to press the key. The bell having been rung at No. 2 station the circuit which is now required to be through transmitters and receivers is as follows:—The plug G being in one of the holes as shown at No. 1 station and the receiver being out the current is from battery wire 50 to block E through strip 14 as heretofore described to wire II. by line wire through wire II to No. 2 to plate 3^a by studs 45 and 12 to ring 9 by strip 18 and key 19 to stud 22 switch 23 contact 33 strip or wire 47 through microphone disk 27 block C wire *w* through receiver to block D wire 54 to strip 14 and by block F through wire 52 to return or earth 49. The diagram will be easily understood from the foregoing description it being understood that the fourth wire shown which is not numbered passes to the fourth station and that a fifth wire is used for the fifth station and so on for the fourteen stations. It will be seen that by this system of intercommunication a wire which is normally a return wire and a battery wire of one polarity only is used which may be represented by the symbol $N+2$ instead of as is usual $N+3$. N being the number of stations and 3 being one return and two battery wires of opposite polarity. According to my arrangement the rocking block 13 acts to disconnect the apparatus desiring to call a station from that pole of the battery to which it is normally connected and to connect it to the opposite pole so that the use of the third wire is dispensed with. It will be further seen that by this system there is no chance of overhearing a conversation going on between other parties as the simple removal of the receiver from the transmitter will not establish a battery circuit through the instrument of the person attempting to listen.

Where the instrument such as I have heretofore described is to be used only for the intercommunication of two persons or stations I modify the same as shown in Figs. 12 to 16.

The instrument for the above purpose is necessarily much simplified but contains the main features of my invention. The receiver it will be seen is of the same construction as that previously described.

The face plate 35 of the transmitter may be perforated as previously described or have a central opening only as shown. The microphone may be the same as shown in Fig. 1 but I have here shown only one cup shaped block 24 in the recess of which is contained the carbonized fiber 25 the block 24 attached

to the diaphragm 31 being a flat disk. Such block is in communication by means of a wire or strip 47 with a screw 47^a Figs. 14 and 15 which passes through the body 2 to the terminal C Fig. 13. The rear block 24 is connected by a wire or strip 47^b to the terminal E a stud 5 on which forms one contact point of the ringing key 19. This key 19 is in contact with the switch strip 23 as shown in Fig. 12 except when pressed in. The other end of the key 19 is in contact with the terminal A by means of a screw 19^a. The strip 32 is attached to the body by a screw 32^a which makes contact with the terminal D. The other end of the strip is in connection with a screw 32^b forming the other contact point of the switch strip 23 when the latter is pressed in by the receiver. When the receiver is out the nose 34 makes contact with the under side of the yoke 37. The terminal B is in contact with the metal flange 36 by means of a screw 36^a said screw projecting through the body 2 so that its point is in contact with and enters the flange the latter being prevented from coming into contact with any other part by means of an insulating packing ring 36^b beneath same. The circuit through the instrument is as follows reference being made partly to the diagram Fig. 16 which shows both receivers as removed from the transmitter and ready for conversation and partly to the preceding figures: The current from the battery passes by way of a wire 60 to terminal E from thence by wire 47^b through microphone by wire 47 to terminal C from the latter through wires w w through and out from receiver to terminal B from latter to flange 36 to nose 34 of switch strip 23 and from latter to strip 19 to terminal A and out to line, from thence it enters the other transmitter at A and passes through it and the receiver in the reverse direction to the battery wire 50 and opposite pole of battery. To send a signal the circuit is from battery to terminal E from latter to key 19 when the latter is pressed down from key to terminal A out to line and terminal A of the other instrument from latter by key 19 to switch strip 23 from latter to strip 32 as the receiver which is in the transmitter is pressing the switch 23 into contact with said strip out to terminal D by wire to bell and to return wire or earth 49.

What I claim is—

1. In a telephone transmitter, a microphone formed of or containing a loose mass of separated carbonized fibers, such as carbonized cotton fibers, substantially as described.

2. In a telephone transmitter, a microphone comprising hard carbon blocks, with cup-shaped interior surfaces, between which is placed a mass of loose carbonized fiber, substantially as described.

3. In a telephone transmitter a microphone formed of or containing a carbonized fiber such as carbonized cotton fiber with an admixture of plumbago or other finely divided carbon substantially as described.

4. In a telephone receiver and in combination with the magnets coil and diaphragm, a base plate, the case such as 43, ring such as 42, adapted to maintain the coils and magnet at a determined distance from the diaphragm, the mouthpiece and clamping means, such as the ring 44, for securing the parts together substantially as described.

5. In combination, a receiver, a transmitter, a ringing key, a ring such as 9 connected with same, holes in said ring, holes in the body of the instrument, a switch board carrying a number of contact plates with holes therein, means for normally holding the ring so that the holes in same will be out of line with the others, a plug adapted to shift the ring and make contact with the plates of the switch board and studs carried by the ring and by the switchboard adapted to be moved from contact with each other when the plug is in substantially as described.

6. In a combined telephone transmitter receiver ringing key and switchboard a pivoted block such as 13 a metallic strip carried by said block terminal blocks such as E F ring 9 adapted to rock the block 13 to cause the strip to make contact with one or other of the blocks E F, means for rocking the ring, a stud 12 carried by the ring, a contact plate 3^a on the switchboard stud 45 on said plate normally in contact with the said stud 12 and means for breaking such contact substantially as described.

7. The combination with the case or body 2, having a central opening, of a plate secured to the case, a rear microphone block secured to the plate and extending through the opening in the case, a diaphragm mounted on the case and a front microphone block secured to the diaphragm, substantially as described.

8. The combination with a yoke as 37 having beveled sides of a receiver having a corresponding beveled mouth piece said receiver adapted to slide into the yoke and a switch adapted to be operated by the wedging action of the receiver substantially as described.

9. In combination a circular intercommunicating switchboard a circular sliding ring a rocking block operated by the same for connecting earth or battery to line and means for operating the sliding ring substantially as described.

10. In combination, the ring 9, strip 18 and key 19 connected thereto ringing key 21 base or switchboard, stud 5 and block 4 substantially as described.

11. In combination, the key 19, switch 23 normally in contact therewith, stud 5 with which the key can make contact, strip 32 with which the switch is adapted to make contact, nose 34 carried by the switch and yoke 37 with which the nose of the switch can make contact substantially as described.

12. The combination with a telephone apparatus of a rocking device a wire to which normally all the instruments are connected

and a battery wire, the rocking device acting
to disconnect the apparatus desiring to call
another station from that pole of the battery
to which it is normally connected and to con-
5 nect it to the opposite pole so that the use of
a third wire is dispensed with substantially
as described.

In testimony whereof I have hereunto set
my hand in the presence of two subscribing
witnesses.

GEORGE LEE ANDERS.

Witnesses:

PHILIP M. JUSTICE,
ALLEN PARRY JONES.