

No. 622,368.

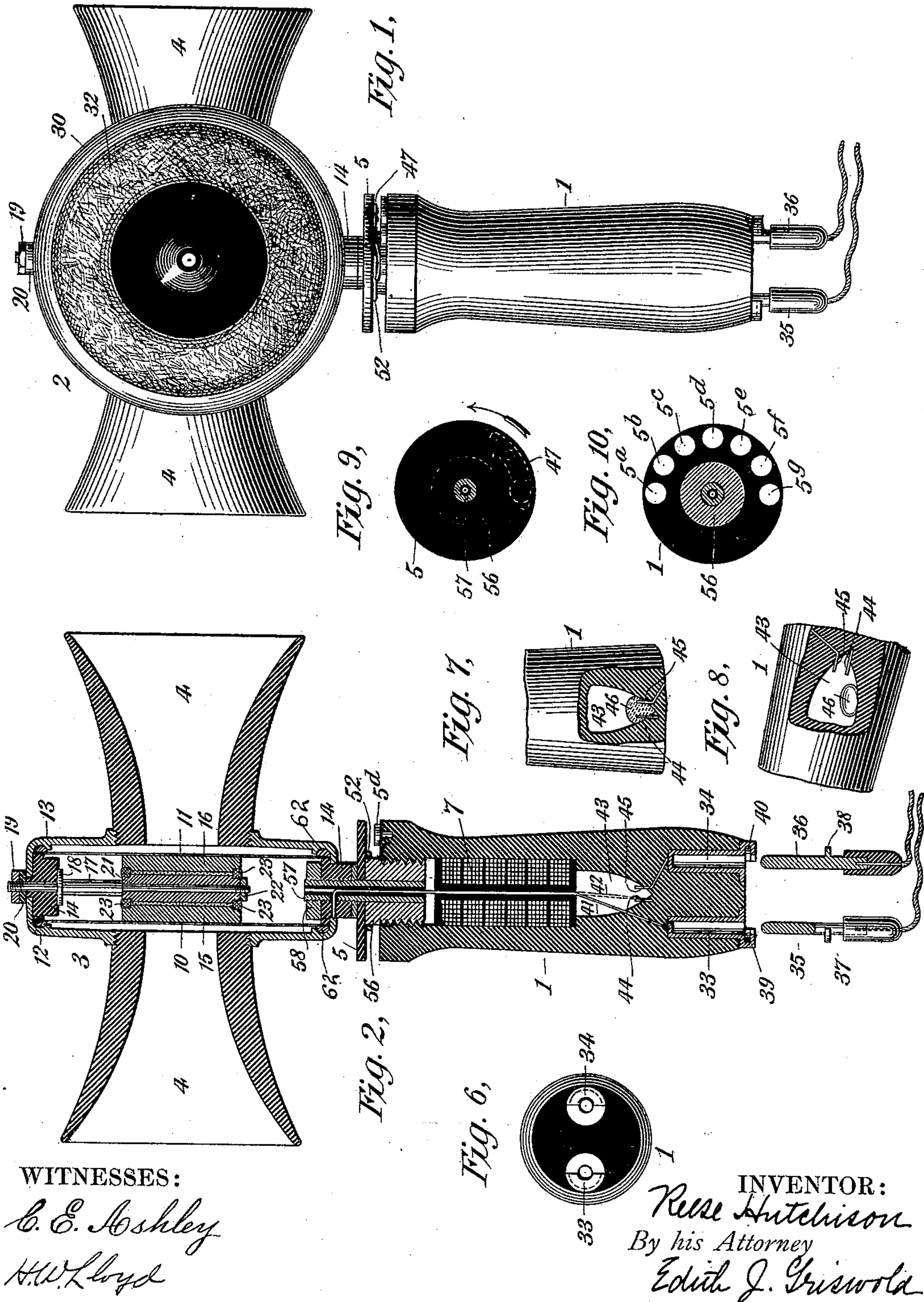
Patented Apr. 4, 1899.

R. HUTCHISON.
ELECTRICAL AUDIPHONE.

(Application filed Feb. 3, 1898.)

(No Model.)

4 Sheets—Sheet 1.



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4 Sheets—Sheet 2.

Fig. 3.

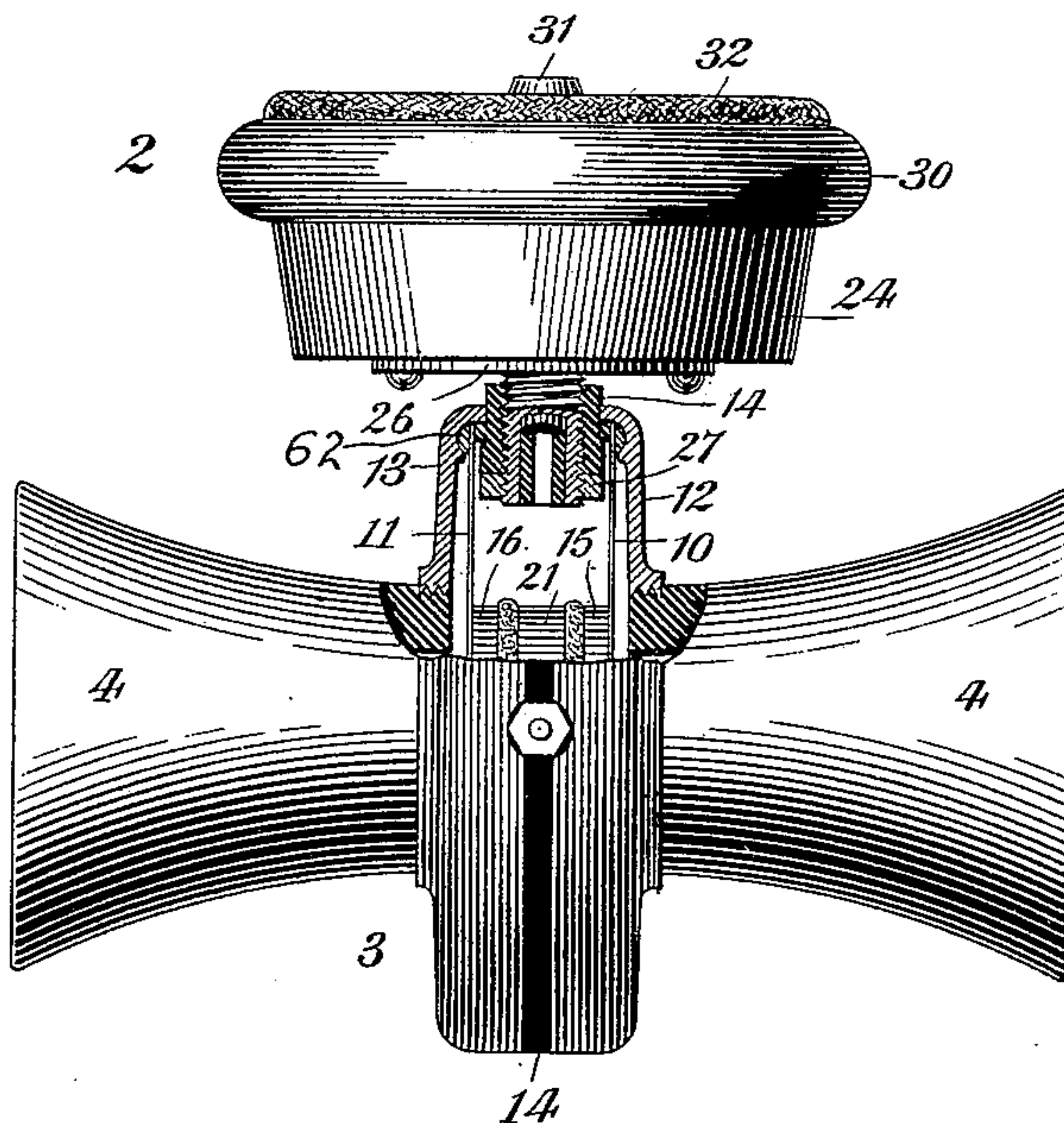


Fig. 4,

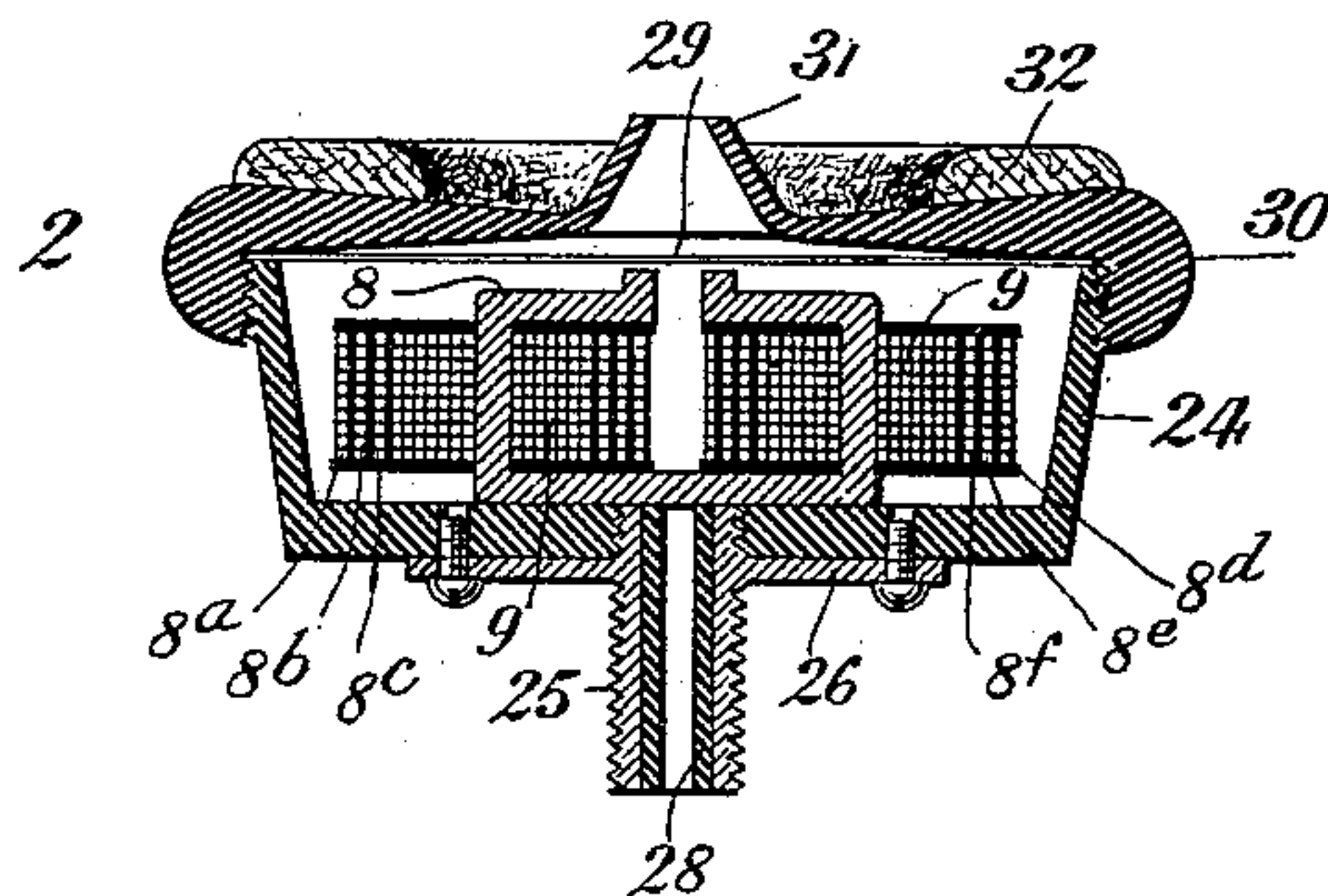
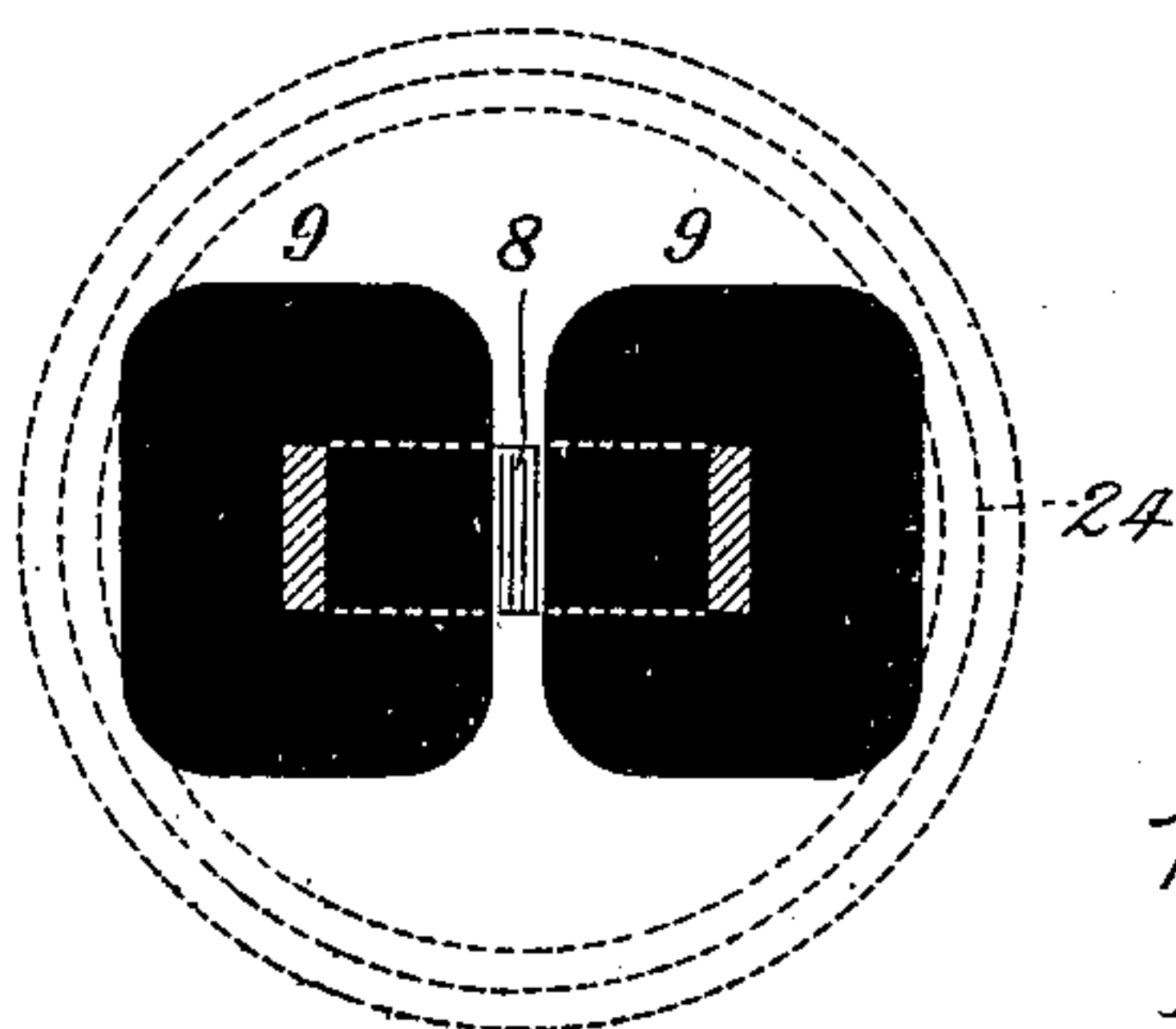


Fig. 5,



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Fig. 12,

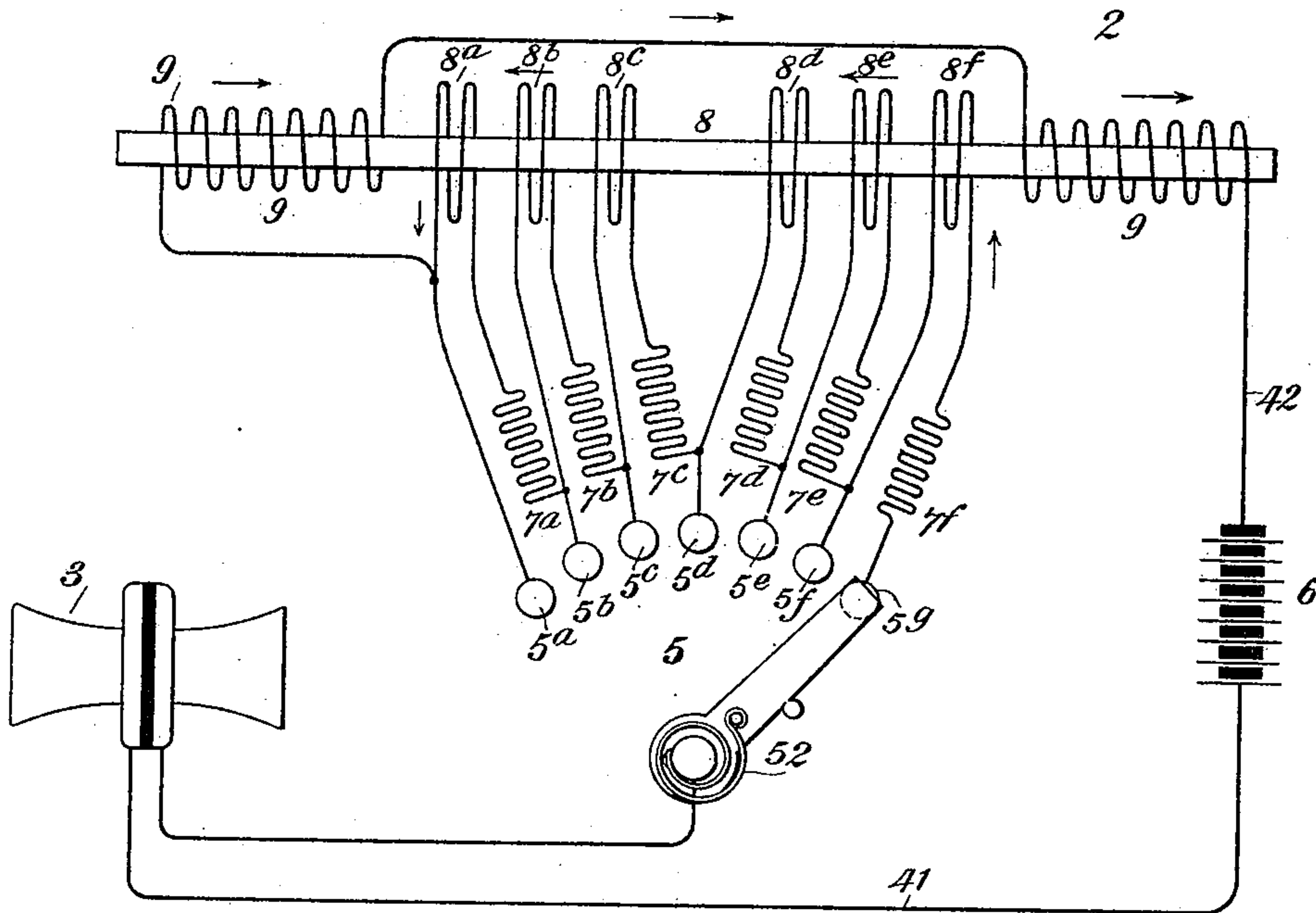


Fig. 13,

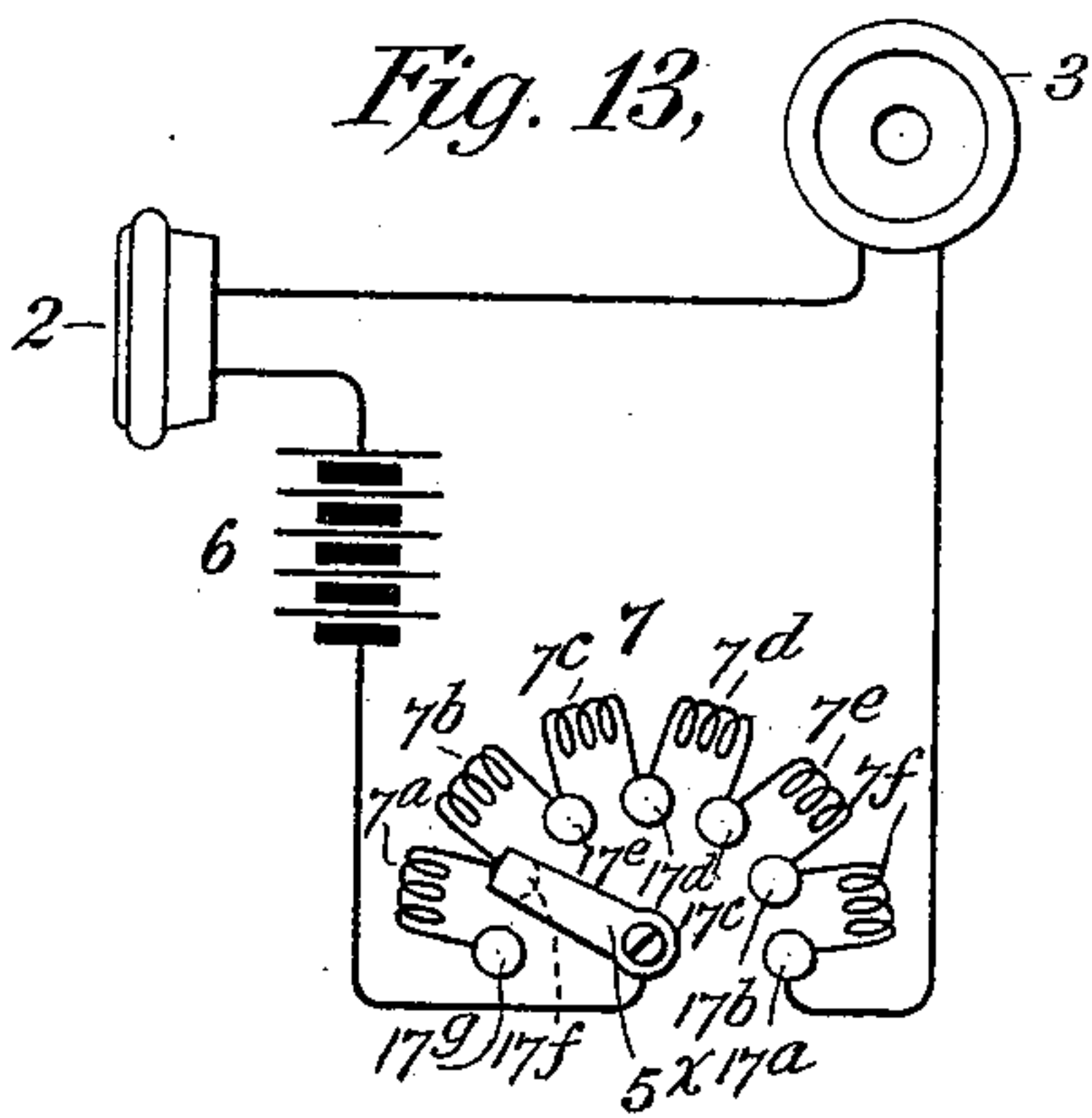


Fig. 14,

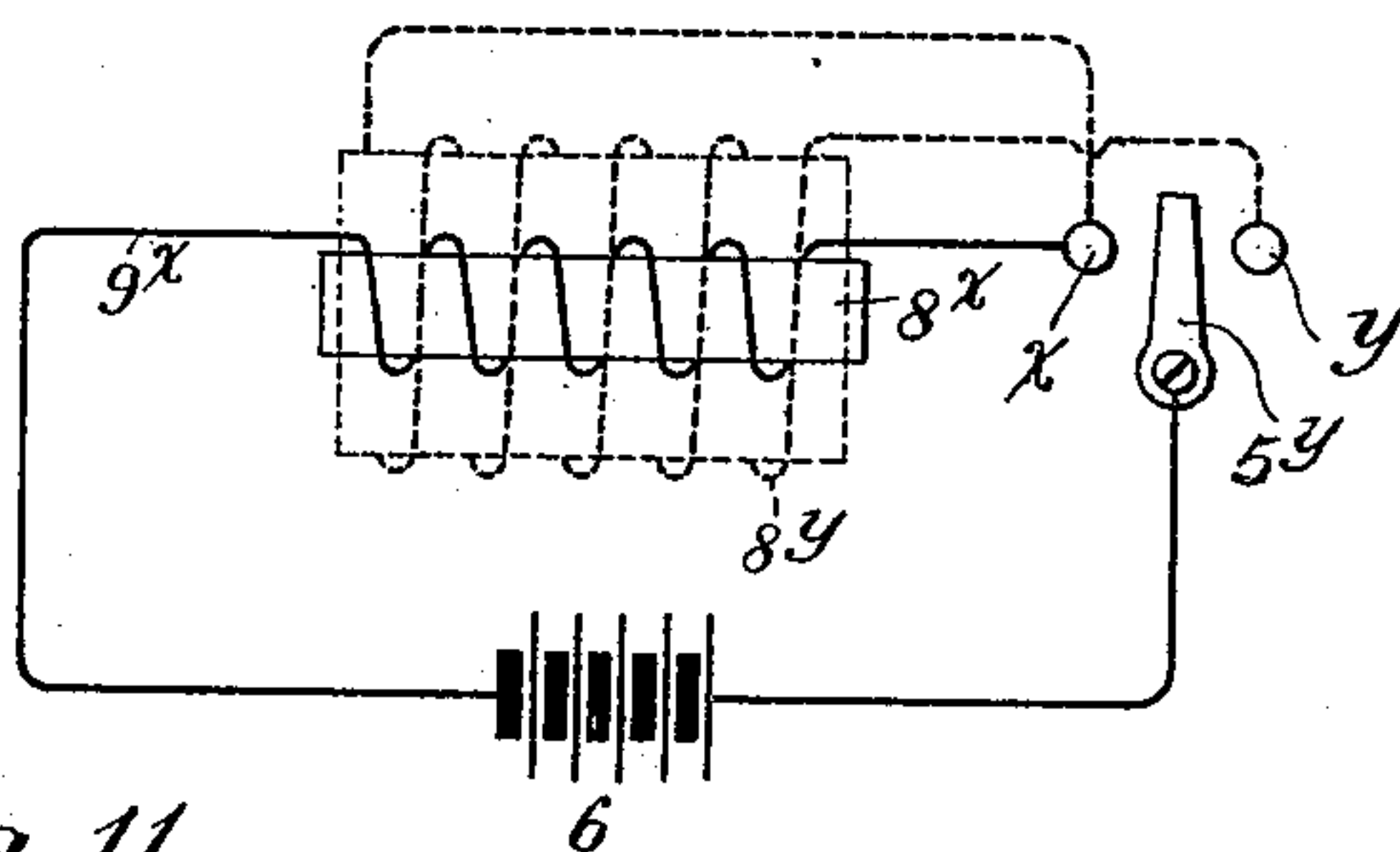
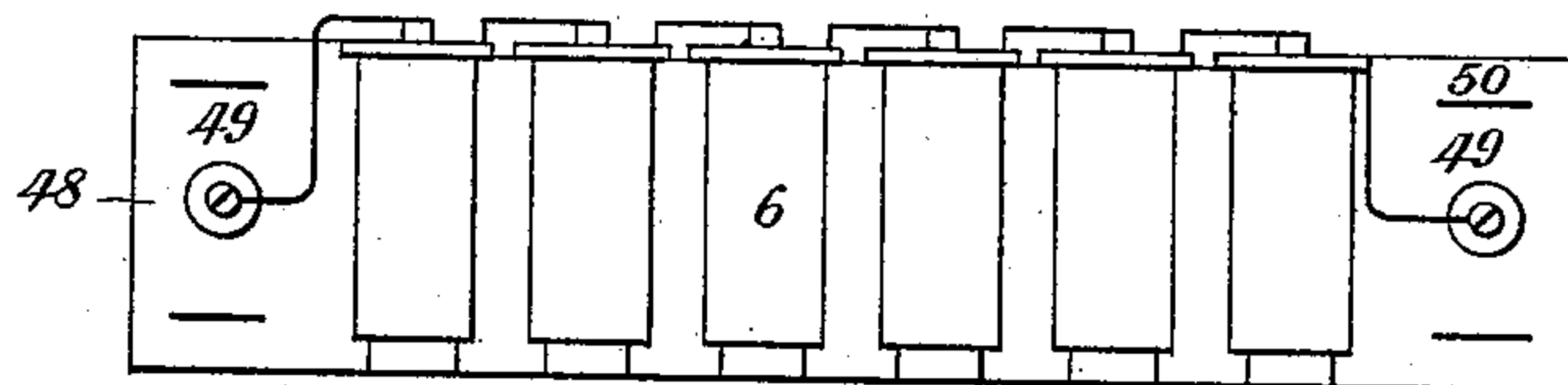


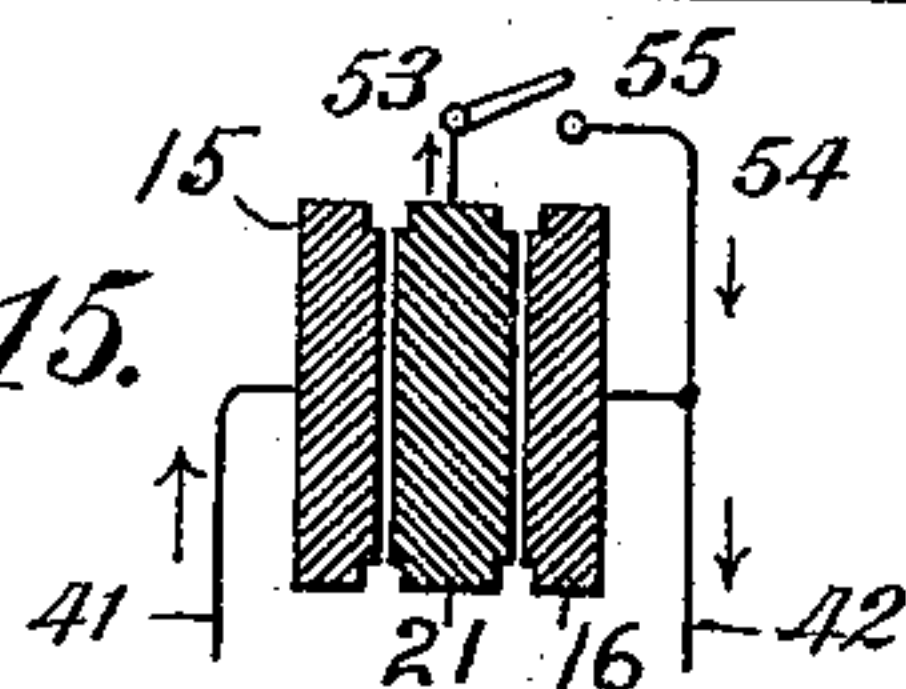
Fig. 11,



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Fig. 15.



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4 Sheets—Sheet 4.

Fig. 16,

Fig. 17,

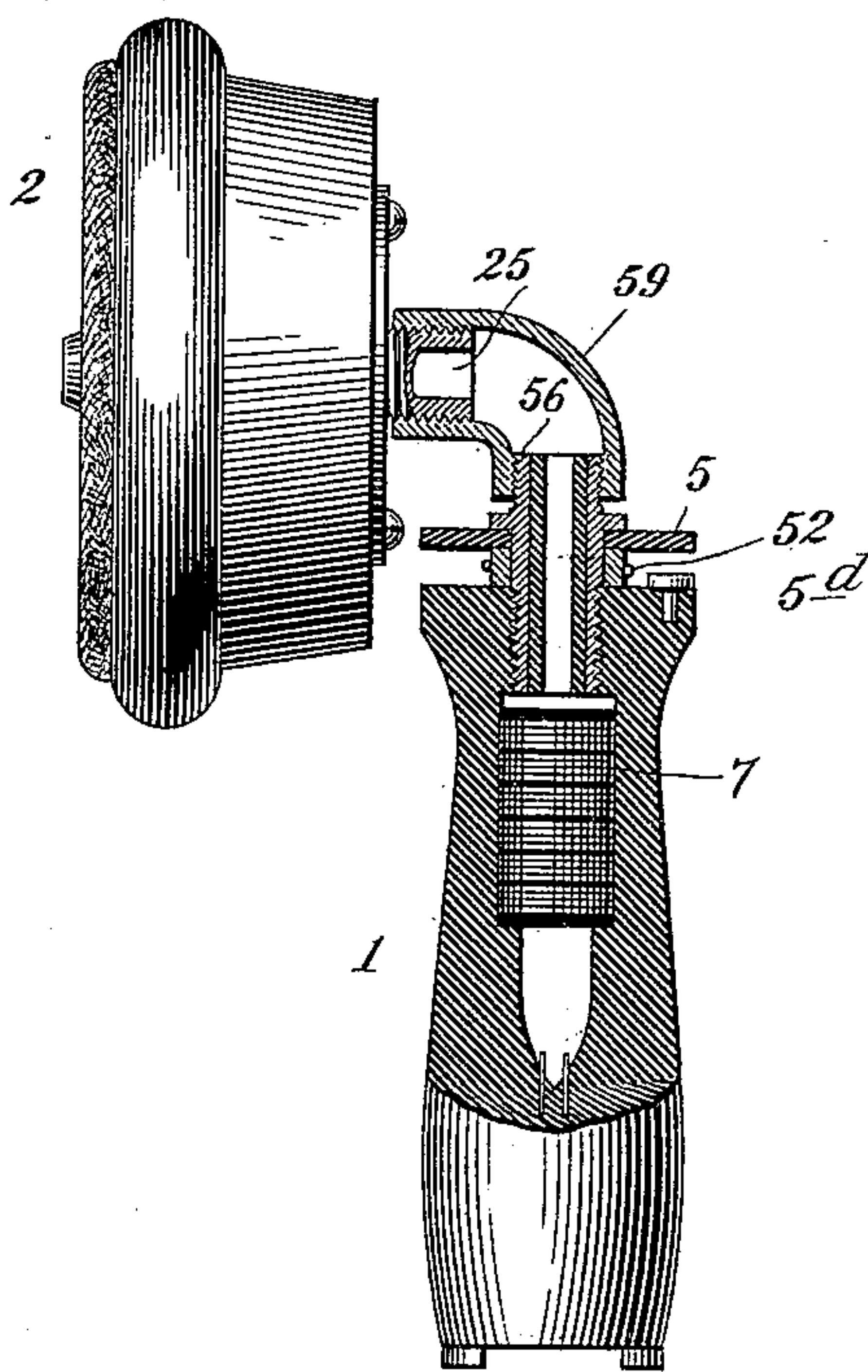
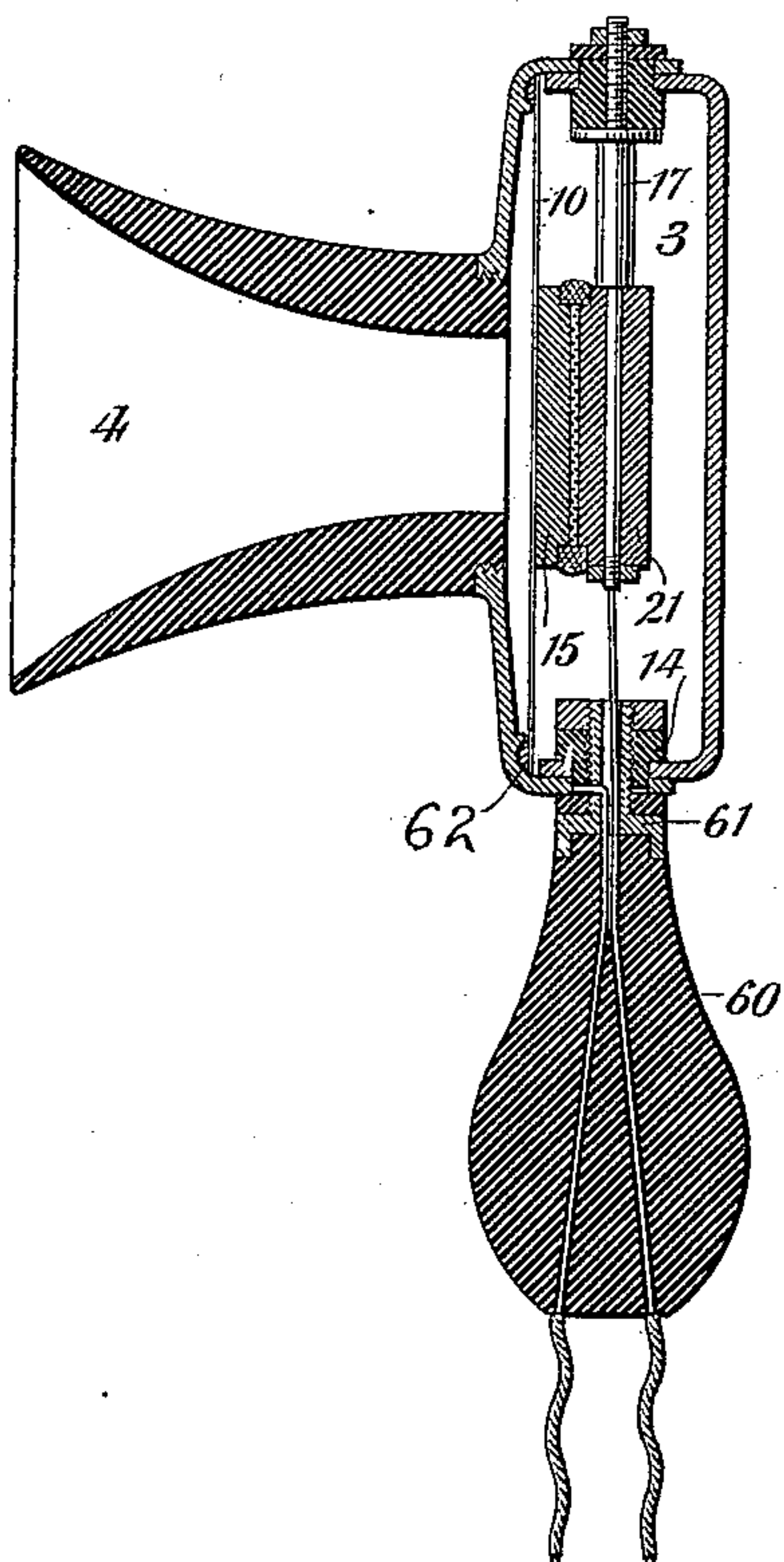
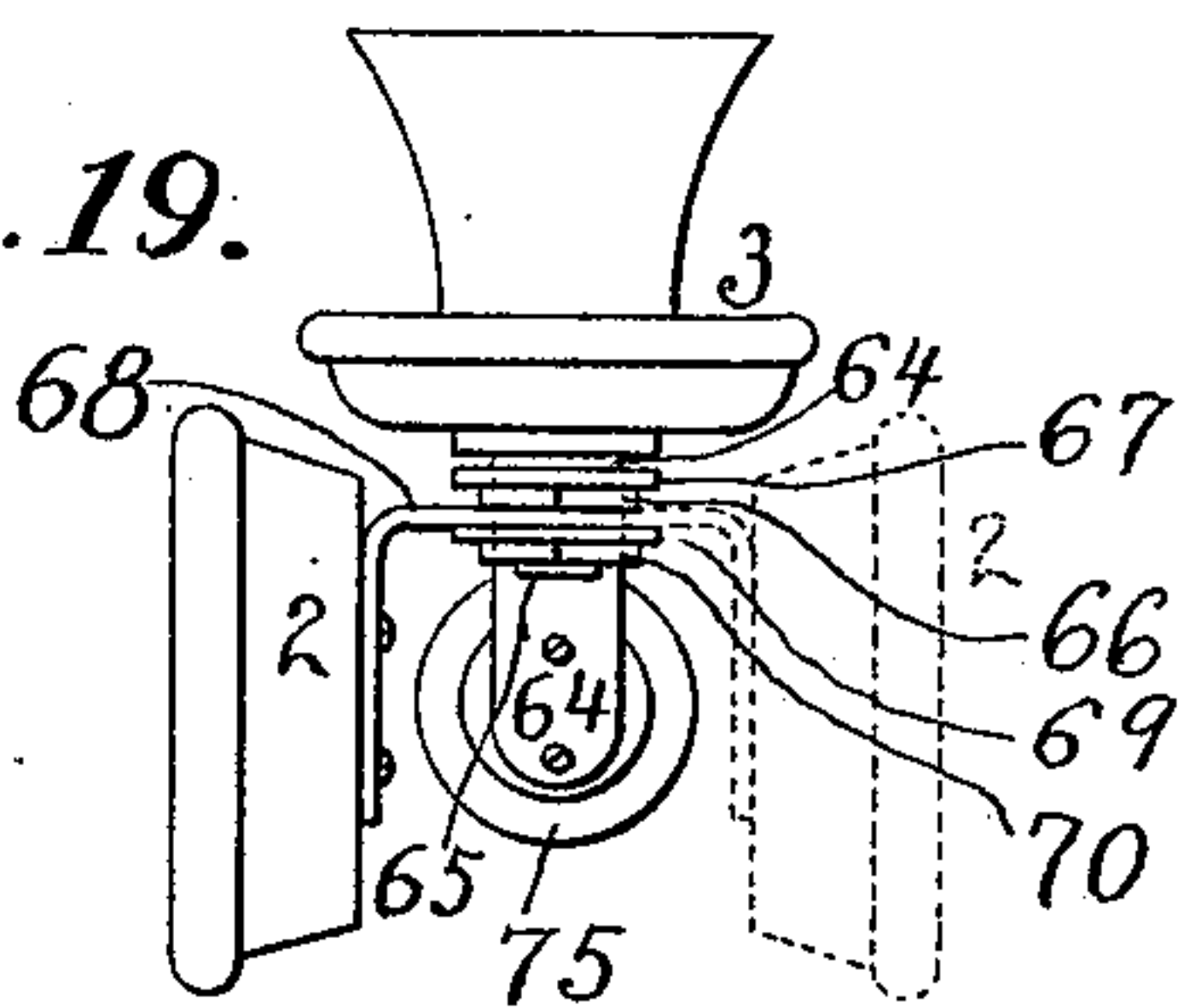
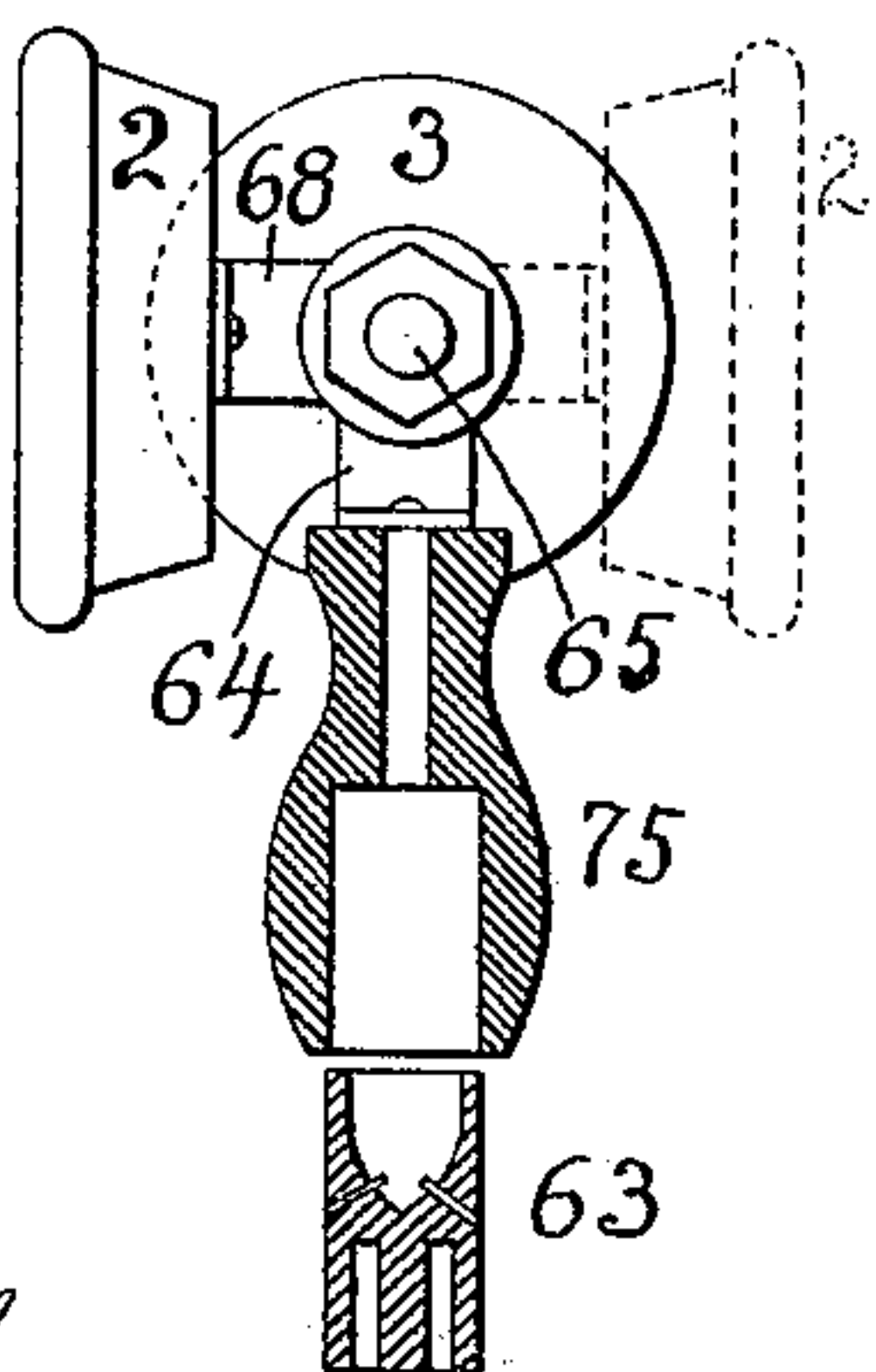


Fig. 18.

Fig. 19.



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UNITED STATES PATENT OFFICE.

REESE HUTCHISON, OF MOBILE, ALABAMA, ASSIGNOR, BY MESNE ASSIGNMENTS, OF ONE-HALF TO JAMES HOWARD WILSON, OF SAME PLACE.

ELECTRICAL AUDIPHONE.

SPECIFICATION forming part of Letters Patent No. 622,368, dated April 4, 1899.

Application filed February 3, 1898. Serial No. 669,011. (No model.)

To all whom it may concern:

Be it known that I, REESE HUTCHISON, a citizen of the United States, residing at Mobile, in the county of Mobile and State of Alabama, have invented new and useful Improvements in Electrical Audiphones, of which the following is a specification.

This invention relates to audiphones, and has for its object to provide an efficient instrument to enable deaf people to hear sounds as they are heard by people with normal ears and to train the ears of deaf persons to hear even without the instrument.

In the accompanying drawings, Figure 1 represents the instrument in one form. Fig. 2 is a sectional elevation thereof. Fig. 3 is a plan view, partly in section. Fig. 4 is a cross-section of the earpiece; and Fig. 5 is a plan of the bobbins of the earpiece, the coil being in section. Figs. 6 to 11 are detail views hereinafter referred to. Figs. 12 to 15 are diagrams of circuits. Figs. 16 and 17 represent sectional views of a modification in which the receiver and earpiece are on separate handles. Figs. 18 and 19 represent another form of the apparatus, drawn to a smaller scale, Fig. 18 being a side view, partly in section, and Fig. 19 a plan of Fig. 18.

Referring to Figs. 1 and 2, one form of the apparatus adapted to be carried about by the deaf person comprises a handle 1, the earpiece 2, a receiving instrument 3, two funnels 4 4, converging toward the diaphragms of the receiving instrument 3, and a regulator 5. A battery 6 is carried in any convenient place—as, for instance, in a belt adapted for the purpose or in a hand-satchel or pocket. The connecting-wires from the battery may pass through the coat or waist sleeve and be secured inside of the sleeve at the wrist, so that when the instrument is not in use it can be readily disconnected. This form is a double receiving instrument so arranged as to enable sounds to rear as well as in front of the person intelligible to him. Moreover, the instrument may be applied to either ear with impunity and there will always be a receiving-funnel opening toward the front without the inconvenience of shifting any part of the instrument to accomplish this effect.

The principle upon which this instrument operates is as follows: Sound-waves upon striking upon the diaphragm of the receiving instrument produce variations in the current strength of the circuit, thereby producing a corresponding vibration of the earpiece-diaphragm. This action is a microphonic one; but the construction of the special parts renders this instrument not only very sensitive but especially adapted to the particular use to which it is to be put.

The drum and general auditory apparatus of deaf persons are very sensitive to loud sounds through the instrument hereinafter described, and in order to obviate any inconvenience or pain from this effect the regulator 5 is inserted, whereby the sensibility of the instrument may be varied to suit different sound intensities. This regulator may be placed on the top of the handle, as shown in Figs. 1 and 2, and its action may be on either or both of the following principles:

Referring to Diagram Fig. 13, suppose the circuit to include the earpiece 2, receiving instrument 3, battery 6, and a resistance 7. If with given battery strength handle 5^x is placed on a contact-point 17^a of resistance 7, the sensibility of the instrument 2 is at its maximum. If handle 5^x is placed on contact-point 17^b, then one coil of resistance 7 is cut into the circuit, thereby lessening the strength of the current and reducing the efficiency of the instrument. If more resistance-coils are cut in by handle 5^x, the sensibility is decreased proportionately.

The other principle above mentioned is represented by Diagram Fig. 14. A piece of soft iron 8^x has wound thereon many turns of a certain size insulating copper wire 9^x, and by placing the handle 5^y of the switch upon the contact-point *x* the current from the battery 6 in passing through the coil 9^x will produce a certain magnetic strength upon the core 8^x. If a coil 8^y of similar wire is then wound on, but in a reverse direction from that of coil 9^x, when the handle is placed upon button *y* the current is sent through both coils 9^x and 8^y, they being connected in series. The magnetic influence of coil 8^y being reverse to that of coil 9^x, the magnetic strength of core 8^x is thereby

lessened. If more coils are similarly wound on and cut in in opposition to coil 9^x, the strength of core 8^x is inversely decreased in proportion to the number of coils added, not
 5 only due to the converse magnetic effect, but also to the decrease of current due to the resistance of these extra coils. The varying of the sensibility of the instruments may be made in various other ways, but the arrange-
 10 ments specified lighten the load on the batteries as the sensibility is decreased, thereby lengthening the life of the batteries.

Any suitable form of receiving instrument 3 may be used; but, as shown in Figs. 2 and
 15 3, I provide two diaphragms 10 11 of proper material to respond to sound-waves projected thereon through the funnels 4 4. These diaphragms are secured in a frame formed of two circular stampings of convenient shape,
 20 such as shown in the drawings, the two parts 12 13 of the frame being electrically insulated from each other by the insulating-ring 14. Washers 62 retain the diaphragms at their peripheries. Secured to the inner side of
 25 each diaphragm 10 11 are electrodes 15 16, preferably of compressed carbon. A stanchion 17 is screwed into the insulating-ring 14, as shown in Fig. 2, and held in place by the collar 18 and nut 19. An insulating-
 30 washer 20 insulates the stanchion 17 from the frame 12 13. The stanchion 17 passes through the center of an electrode 21, which is rigidly held in place, as shown in Fig. 2, by nut 22, screwed on the lower end of the stanchion.
 35 The opposing circumferential edges of the electrodes 15 and 21 and of the electrodes 21 and 16 are grooved, as shown, for the purpose of retaining rings 23, of flimsy woolen or other suitable fabric, to hold granulated
 40 carbon in the spaces between the electrodes 15 21 and 21 16. These rings 23 do not perceptibly affect the sensibility of the instrument to respond to sound-waves.

Any suitable earpiece may be used; but I
 45 prefer the form shown in Figs. 4 and 5, which constitutes a very powerful and efficient instrument. To the shell 24, of vulcanite or other non-conducting material, is secured the core 8, formed in the shape shown in one
 50 piece of finely-annealed soft iron. A tube 25, secured to the shell 24 by the flange 26, is screwed into the insulating-ring 14 of the frame 12 13, and a nut 27, Fig. 3, holds the earpiece in place. An insulating-bushing 28
 55 may be introduced into the tube 25 for insulating the necessary conducting-wires.

The wire on bobbins 9 of core 8 forms part of the main circuit. Outside of these bobbins coils 8^a 8^b 8^c 8^d 8^e 8^f are wound in a reverse direction to that of the coils of the bobbins 9. A thin iron diaphragm 29 is held in place by the insulating-cover 30. This cover or front piece is turned to form a small hollow cone-frustum 31 at the center, adapted
 60 to enter the opening or concha of the ear and focus the sound-waves made by the diaphragm 29 onto the drum of the ear. A small

woolen cushion 32 may be fastened to the front or cover 30 for comfort and may be readily renewed when soiled, but is preferably omitted when used by persons totally deaf. 70

The frame 12 13, carrying the earpiece 2 and the receiving instrument 3, is secured to the handle 1 in any convenient manner. As shown in Fig. 2, the plug 56 is screwed into
 75 the upper end of the handle, and a tube 57, fitted in the said plug or forming part thereof, extends upward and is screwed into the insulating-ring 14 and secured by nut 58.

The handle 1 is of insulating material and 80 is made hollow to permit the insertion of a bobbin on which are wound the coils of resistance 7, although these resistance-coils may be anywhere in the circuit.

The lower part of the handle is provided 85 with two metal sockets 33 34, Figs. 2 and 6, adapted to receive the plugs 35 36 at the end of the wires connected with the battery. When the plugs are inserted in the sockets, they are given a half-turn to bring the semicircular
 90 flanges 37 38 into the semicircular recesses 39 40 of the handle to securely retain the plugs.

Insulated conducting-wires 41 42 lead from the sockets 33 34 to the instruments 2 and 3 and may pass through a hole in the center of
 95 the resistance-bobbin. As it is not necessary that the batteries should always be in closed circuit, a construction is used whereby the circuit is closed only when the handle 1 is held vertically or in the most natural position
 100 when the instrument is in use. An opening 43 in the handle is formed approximately conical, and near the lower reduced end thereof are two points, preferably of platinum, 44 45. Instead of directly connecting wire 42 to
 105 socket 34 it is connected to one point 44. A globule of mercury 46, Figs. 7 and 8, is retained in the conical opening 43, which when the handle is in a vertical or approximately vertical position, Fig. 7, connects the plat-
 110 inum points 44 and 45, but when the handle is turned downward, Fig. 8, falls away from the platinum points, and thus opens the circuit.

The sockets 33 34 and recess 43 may be formed in a plug 63, to be inserted in the end
 115 of the handle 75, as represented in the form shown in Fig. 18, which form is hereinafter described.

The regulator 5, Figs. 9 and 10, comprises a series of contact-points 5^a 5^b 5^c 5^d 5^e 5^f 5^g, 120 the main line being connected to point 5^a, and a regulator-disk 5, carrying a contact-piece 47. Although this regulator is shown on the handle in some of the figures mounted upon and adapted to rotate about tube 57, the regu-
 125 lator may be placed in any other convenient position. It may be, for instance, separated from the instruments and placed in a convenient position to be operated by the free hand. The connections cannot be well shown in the
 130 main figures of the drawings, but are diagrammatically shown in Fig. 12, hereinafter explained.

The belt 48, Fig. 11, is well adapted to carry

the battery 6 and is provided with binding-posts 49 49 and may be provided with button-holes 50 or straps or the like to secure the belt to the person using the instrument.

Referring now to Fig. 12, the connections are as follows: Wire 41 from battery 6 connects with one of the diaphragms—say 10—of receiver 3. The other diaphragm 11 is connected to the regulator disk or lever 5. Button 5^a is connected to the main wire leading to coils 9 9 of earpiece 2 and thence to the battery 6. If the reverse coils 8^a 8^b, &c., are not to be used, the resistances 7^a 7^b, &c., only are connected to the points 5^a 5^b 5^c, &c., or if the resistances are not used the coils 8^a 8^b 8^c, &c., are connected instead of coils 7^a 7^b, &c. However, as shown in Fig. 12, both coils 8^a 8^b, &c., and coils 7^a 7^b, &c., are used, one coil 8^a and one coil 7^a being connected in series and to two contact-points 5^a 5^b, as shown. Coils 8^b and 7^b are connected in series to contact-points 5^b and 5^c, and so on.

It will be evident that if regulator-disk 5 is turned so that its contact 47 contacts with point 5^a all the reverse coils 8^a 8^b, &c., and all the resistance-coils 7^a 7^b, &c., will be cut out of the circuit and the instrument is at its maximum power, and that as the regulator is turned to cut in more reverse coils and resistance-coils the power decreases, as explained.

The regulator-contact 47 is sufficiently large and the contact-points 5^a 5^b, &c., sufficiently near together to make it impossible for contact 47 to pass from one contact-point 5^a, &c., without first touching the next contact-point. Without this precaution the circuit would be broken in passing from one button to the next, thus producing a very disagreeable and injurious effect upon the ear.

To prevent the regulator from being carelessly left at the greatest sensibility, whereby any extra loud noise taking place when the instrument is first applied might hurt the ear, the regulator-button 5 is provided with a suitable spring 52, tending to return and hold the regulator at the point of least sensibility, leaving the user to gradually rotate the regulator-button to adjust the regulator to the proper degree of sensibility. This regulator to vary at will the sensibility of the audiphone is of the utmost importance, as without it the instrument could not be used by certain people, due to the severe pain caused by the too-sensitive action thereof upon the unused ear. With the regulator it is possible to gradually accustom a deaf person to become used to sounds without causing any inconvenience to him, and in many instances persons born deaf and dumb have been so trained with this instrument that such persons can now hear without the instrument.

With the instrument as described a cut-out switch may be applied to shunt the current past one of the electrodes 15 or 16 for extreme delicacy. Fig. 15 represents a diagram in

which shunt-wires 53 54 may be connected at switch 55, whereby the current may be passed from wire 41 through electrodes 15 and 21 and inclosed granulated carbon directly to wire 42.

Figs. 16 and 17 represent another form of apparatus adapted to be used as an instruction outfit. The earpiece 2 is secured in any convenient way to a handle 1 similar to the handle of the portable instrument. As shown in Fig. 17, an elbow 59 receives the tube 25 of the earpiece at one end and at the other end the upper end of the plug 56. The receiving instrument 3, Fig. 6, has but one funnel 4 and but one diaphragm 10. One of the electrodes is also dispensed with. The frame of the receiver is secured to a plain handle 60 by plug 61 screwing into insulating-ring 14.

Another form of portable instrument is shown in Figs. 18 and 19. The receiving instrument is single in this case, and the mounting of the earpiece and receiving instrument on the handle is such that their relative positions may be readily changed to suit the instrument for either ear for sounds from the front or any other direction toward the user.

In the construction shown the earpiece 2 has been mounted to be turned from the position shown in full lines to that shown in dotted lines in Figs. 18 and 19, although it is evident that the receiving instrument may be so mounted instead. The receiving instrument 3 is mounted on an L-piece 64, secured to the handle 75 by screw-plug 65 and nut 66, 67 being a washer. A bent arm 68 has the earpiece 2 rigidly secured thereto and is pivoted at the back of the receiving instrument by being mounted to turn on the plug 65. This arm 68 is held by the washer 69 and nut 70 in such a manner that in whatever position it is placed it is maintained there by friction.

The various forms described may be varied without departing from my invention.

I claim as my invention—

1. The combination of an audiphone for the use of deaf persons, with means for varying at will the intensity of sounds reproduced in the audiphone, to suit the sensitiveness of the ear of the person.

2. The combination of an audiphone having a microphonic action, for the use of deaf persons, with a regulator to control the intensity of sounds in the instrument.

3. In an audiphone, an electrical earpiece provided with a diaphragm and electrical means for operating the diaphragm, in combination with a handle supporting the earpiece, and a device on said handle to regulate at will the intensity and effect of the electric current.

4. In an audiphone for the use of deaf persons, an electrical earpiece, a receiving instrument, and an electric circuit including the earpiece and the receiving instrument, in combination with a handle supporting the ear-

piece and the receiving instrument, and a device on said handle to regulate the intensity and effect of the electric current.

5 5. An earpiece, a handle supporting the same, and an electric circuit, the said earpiece being provided with a diaphragm and a core to act thereon, coils in said electric circuit wound on said core, reverse coils in the same circuit also wound on the same core, in
10 combination with a movable device on said handle to cut in or out of the circuit the said reverse coils, substantially as described.

15 6. The combination of a receiving instrument, and an electric circuit including the receiving instrument, with a core, coils in the said electric circuit wound on said core, and reverse coils in the same circuit also wound on said core, a diaphragm acted upon by said
20 core, and means for cutting in and out of the circuit the said reverse coils, substantially as described.

25 7. An electric circuit, an electromagnet comprising a soft-iron core, coils wound on said core in one direction and reverse coils wound outside the first said coils on the same core in the opposite direction, the said coils being
in series in the said electric circuit, and means for cutting in and out of the circuit any of said coils.

30 8. An electric circuit, an electromagnet comprising a soft-iron core, coils wound on said core in one direction and reverse coils wound on the same core in the opposite direction, the

said coils being in series in the said electric circuit, and means for cutting in and out of
35 the circuit the said reverse coils.

9. An electric circuit, an earpiece comprising a casing, a diaphragm, and a core to act on the diaphragm, coils in the said electric circuit wound on the said core, reverse coils
40 in the same circuit also wound on the said core, and means for cutting in and out the said reverse coils, substantially as set forth.

10. In an audiphone, an electrical earpiece provided with a diaphragm and electrical
45 means for operating the same, a device for regulating at will the intensity and effect of the electric current, and thereby the sensibility of the earpiece, and means for normally holding the regulator at the point of least sensibility.
50

11. An audiphone comprising an earpiece instrument and a receiving instrument, in combination with a bent arm to which one of the said instruments is rigidly secured, and
55 which is pivoted at the back of the other of said instruments, substantially as and for the purpose set forth.

It testimony whereof I have signed my name to this specification in the presence of
60 two subscribing witnesses.

REESE HUTCHISON.

Witnesses:

MAUD F. KELSEY,
CHAS. A. PEARD.