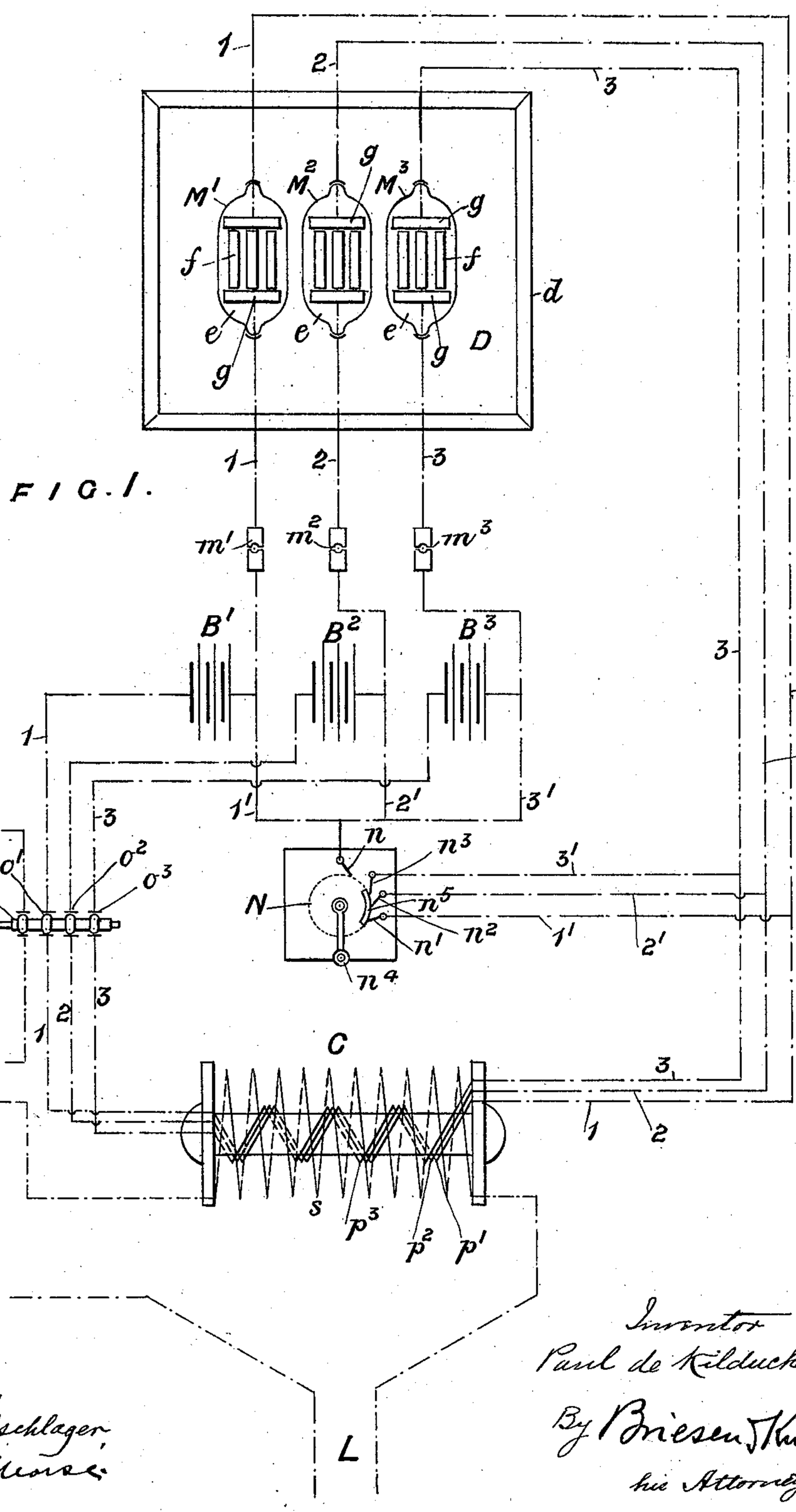
No. 607,801. Patented July 19, 1898.

P. DE KILDUCHEVCKY.

LONG DISTANCE TELEPHONE.

(Application filed Feb. 10, 1897.)

(No Model.) 3 Sheets—Sheet 1.



F I G. 1.

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(No Model.) 3 Sheets—Sheet 2.

FIG. 2.

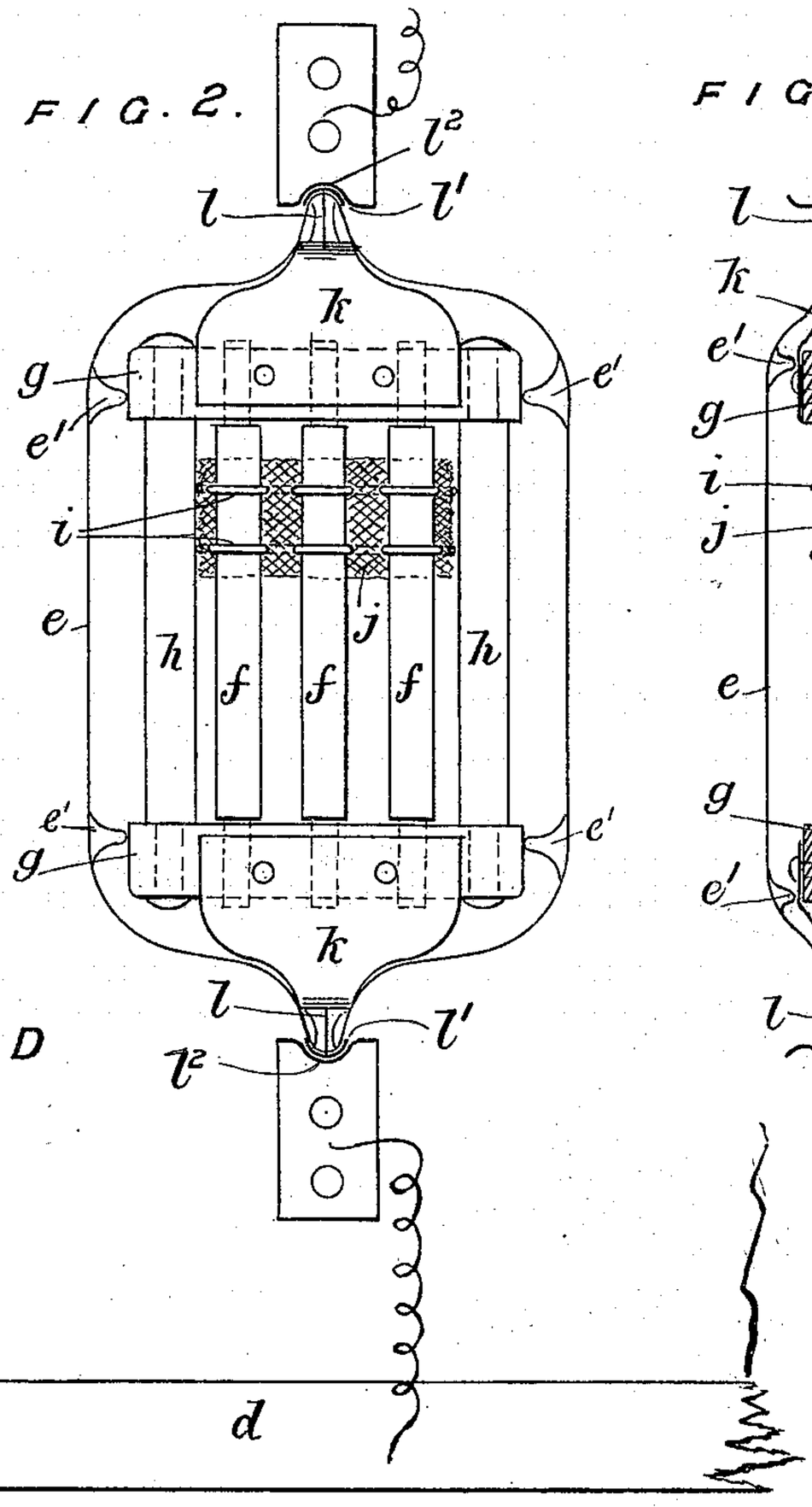
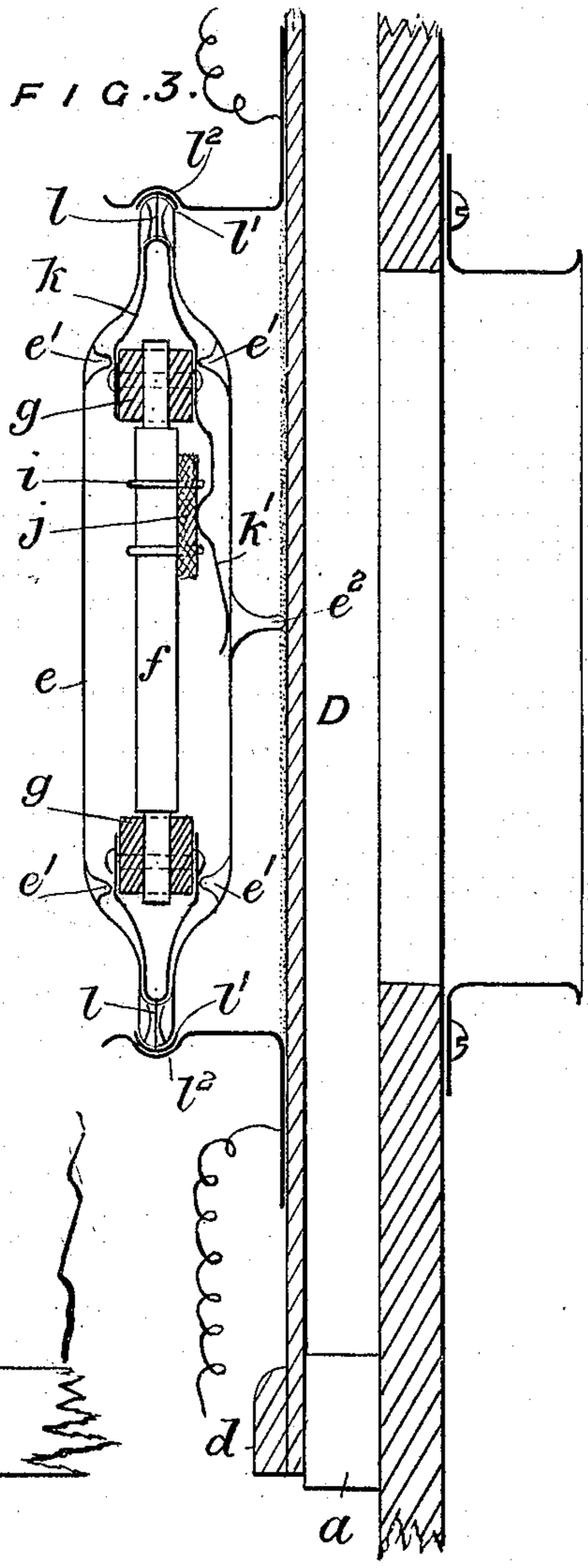


FIG. 3.



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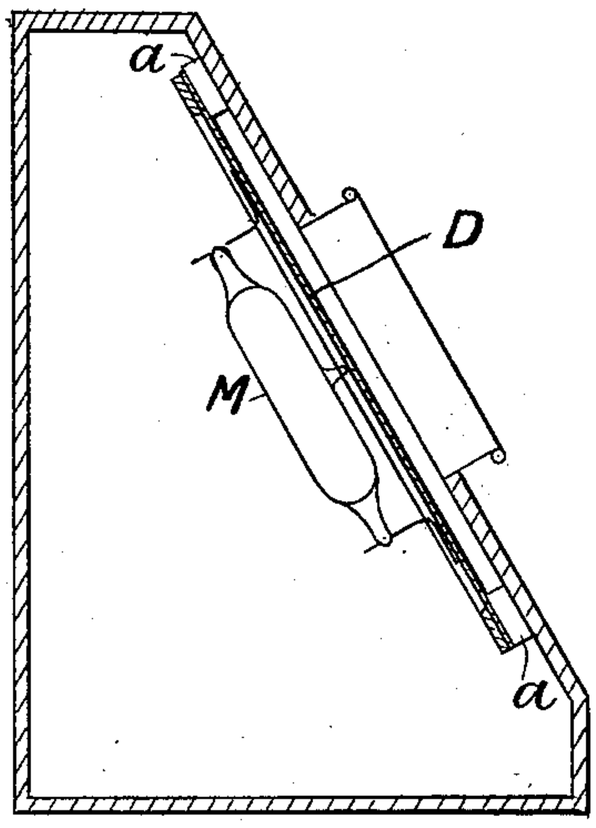

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(No Model.) 3 Sheets—Sheet 3.

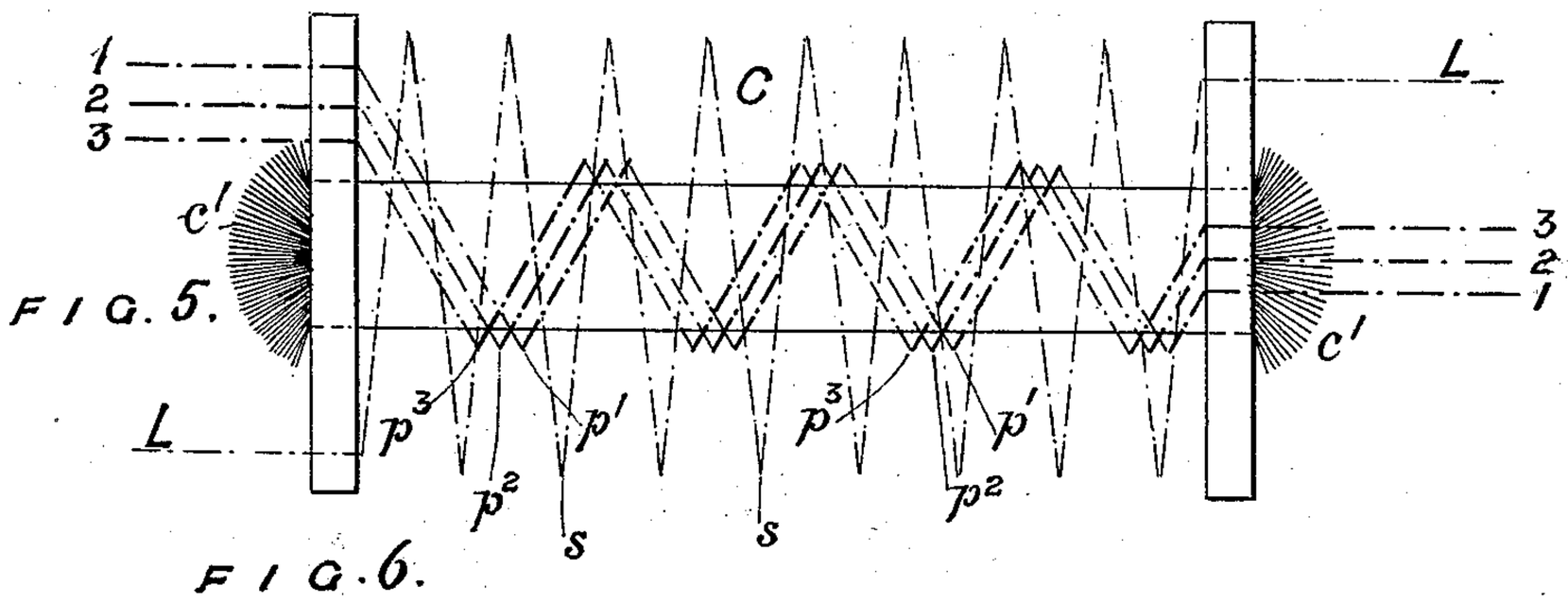


FIG. 5.

FIG. 6.

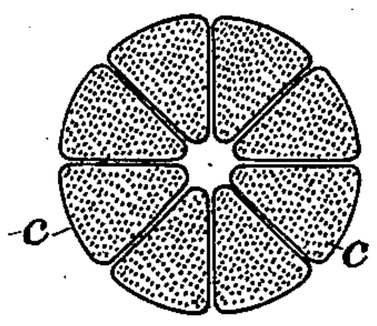
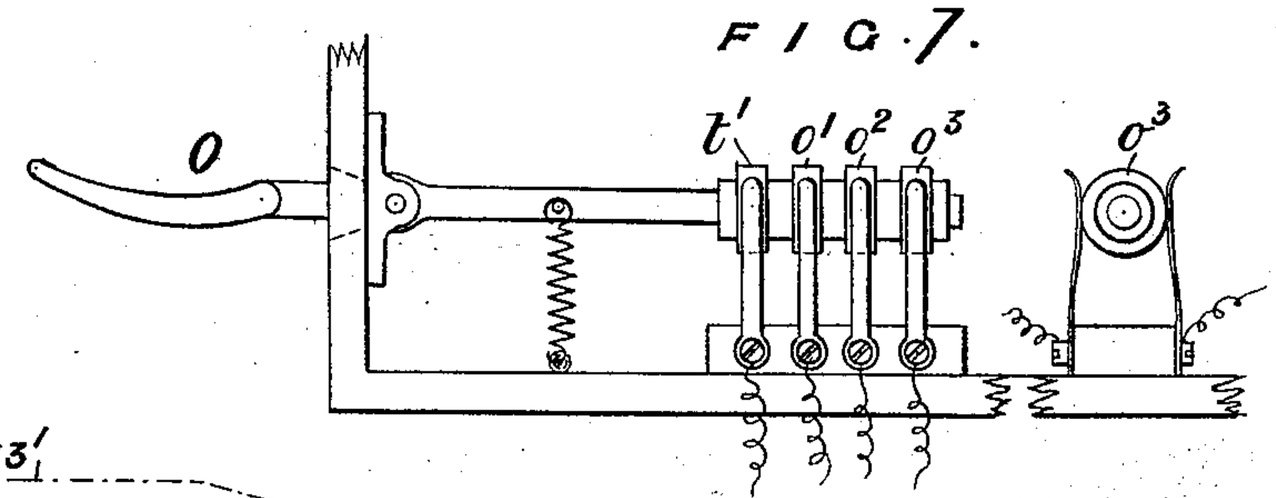


FIG. 7.



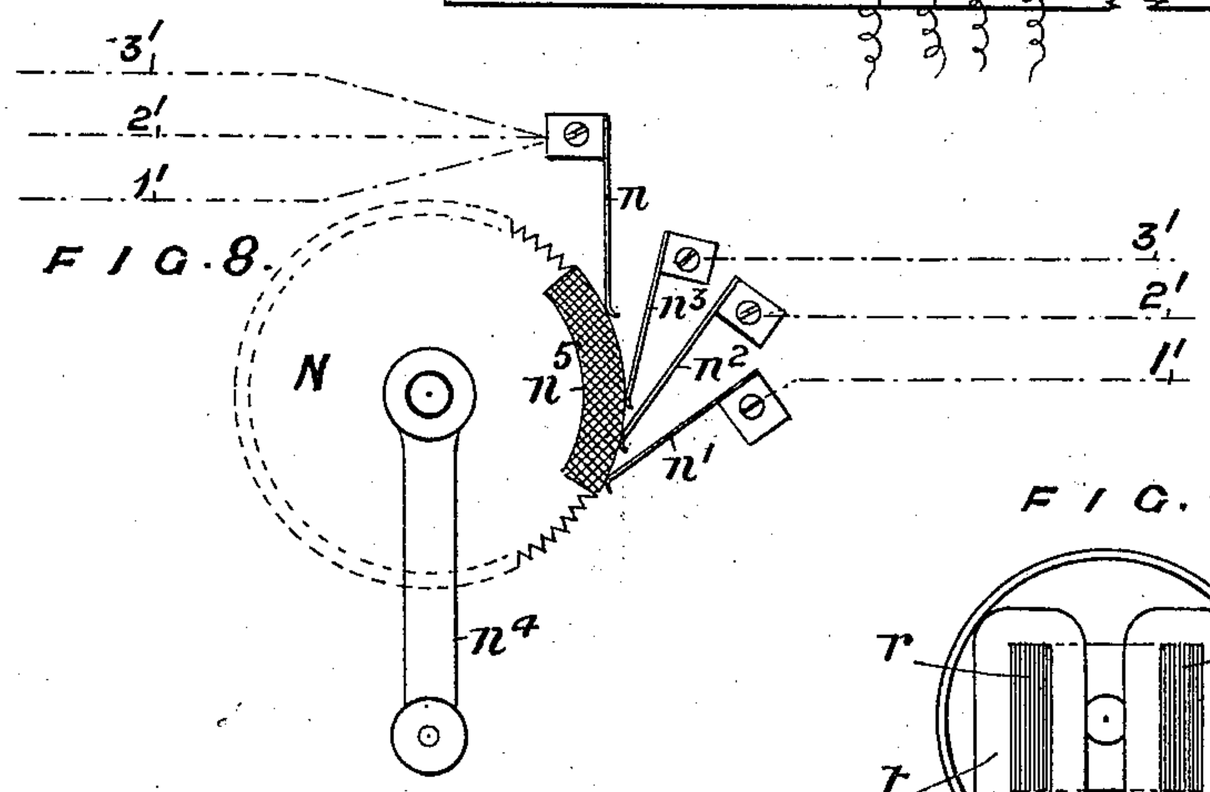


FIG. 8.

FIG. 11.

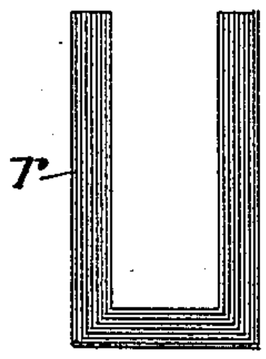
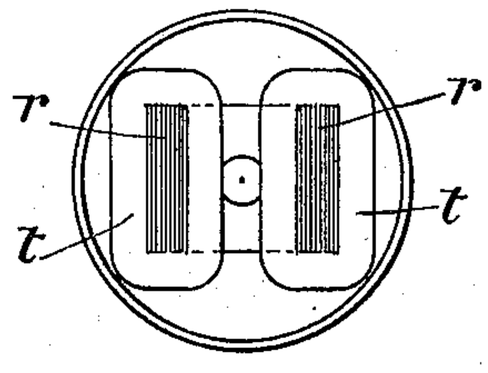


FIG. 9.

FIG. 10.



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UNITED STATES PATENT OFFICE.

PAUL DE KILDUCHEVCKY, OF LONDON, ENGLAND, ASSIGNOR TO THE KILDUCHEVCKY MEGA-TELEPHONE SYNDICATE, LIMITED, OF SAME PLACE.

LONG-DISTANCE TELEPHONE.

SPECIFICATION forming part of Letters Patent No. 607,801, dated July 19, 1898.

Application filed February 10, 1897. Serial No. 622,779. (No model.)

To all whom it may concern:

Be it known that I, PAUL DE KILDUCHEVCKY, electrician, of Devonshire Chambers, 16 Bishopsgate street without, in the city of London, England, have invented a new and useful Loud-Speaking Long-Distance Telephone, of which the following is a full, clear, and exact description.

This invention has for its object to enable clear, articulate, loud-speaking telephonic communication to be established over longer distances than it has heretofore been possible to communicate by existing telephones.

The invention consists, first, of a transmitter comprising an improved microphone, permitting the use of powerful currents without danger of injury to the microphone, the microphone being, moreover, completely protected from external causes by which its efficiency might be impaired; the combination of a plurality of microphones and batteries with an induction-coil having multiple primary circuits, whereby the power of the transmitter may be readily regulated according to the varying distances over which conversation may be required to be carried on, or according to the particular requirements of each circuit with which the transmitter may be put in connection, or according to the effect to be produced in each particular case; means of rendering the vibrations of the diaphragm more sharp and defined, so as to insure clearness of articulation and improve the timbre, and, lastly, an improved siren-call device.

The invention also comprises an improved construction of receiver for use in combination with the above-mentioned transmitter and other combinations of parts, as hereinafter described, and specified in the claims.

Reference is to be had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a general diagram of the whole system, and Figs. 2 and 3 are part rear and cross-sectional views of one of the microphones. Fig. 4 is a cross-section of the transmitter-case, showing the inclined position of the diaphragm and microphones. Fig. 5 is a diagram of the induction-coil. Fig. 6 is a cross-section of the core of the induction-coil. Fig. 7 is a side and end view of the telephone hook-switch. Fig. 8 represents the call device. Fig. 9 is a sectional view of the receiver. Fig. 10 is an end view of the electromagnet, and Fig. 11 an elevation of the magnet-core separately.

The same letters and numerals of reference indicate the same parts in all the figures.

Upon the back of diaphragm D are mounted a plurality of microphones M' M^2 M^3 (say three) in parallel circuits, each circuit comprising a microphone, a battery, and a separate primary winding of an induction-coil C, having as many parallel primary windings p' p^2 p^3 as there are microphones in the transmitter. The diaphragm D is of wood, has a marginal wood frame *d*, and is mounted, preferably in the rearwardly-inclined position shown in Fig. 4, by being fixed to corner-cushions *a* of rubber, there being clearance left between the edges of the diaphragm and the sides of the case, so that the diaphragm shall be shielded as much as possible from external vibrations.

In order to render the vibrations of the diaphragm more sharp and defined and to insure clearness of articulation, the inside of the front and sides of the case and the surfaces of the diaphragm are coated with a layer of crushed glass, (such as used for medium-quality glass paper,) corundum, or other granular non-hygroscopic substance attached by glue bichromated to render it non-hygroscopic. In Fig. 3 of the drawings the rear face of the diaphragm is shown as provided with this granular material.

Each microphone is inclosed in an exhausted glass bulb *e*, by which the supports of the carbon pencils are held and through which the vibrations of the diaphragm are transmitted to the pencils. Each microphone comprises a plurality of carbon pencils *f*, whose cylindrical ends of reduced diameter are received loosely in corresponding holes in a pair of carbon blocks *g*, braced rigidly together by rods *h* of glass. The carbon pencils *f* are electroplated with copper (except the contact portions) and are connected so as to vibrate in unison by being bound together by wires *i*, of aluminium, laced through a pad *j*, of asbestos cloth, upon which presses a spring *k'*. The carbon-supporting blocks *g* are also

copperplated (except the poles and the side next the pencils) and are embraced by clips *k*, of aluminium, riveted to the blocks *g*, the one member of the clip being extended to form the spring *k'*, which presses against the side of the glass bulb *e* and against the asbestos pad *j*, so as to transmit vibrations directly from the bulb to the pencils *f*. The bulb *e* is contracted or pinched in, as at *e'*, so as to grip the pencil-supporting blocks *g*, and the ends of the bulb are drawn down so as to embrace the tapered bowed portions of the clips *k k*. The clips *k* serve to make electrical communication with the platinum leading-in wires *l*, sealed through the ends of the bulb in the usual way of sealing in those of incandescent lamps.

During the operation of exhausting the bulb a current is passed through the microphone to enable occluded gases and moisture to be extracted from the carbon. The microphone being inclosed in an exhausted bulb, the power of the current may be increased to any required extent without liability of burning the carbons, and the carbon pencils are protected from atmospheric moisture, from dust, and from derangement. It is, however, to be understood that instead of a vacuum, the bulb may contain an inert atmosphere, such as nitrogen; but a vacuum is preferred. The leading-in wires *l* terminate externally in convex copper contact-disks *l'*, which are held between and make electrical contact with corresponding concave holders l^2, formed by spring-brackets fixed to the back of the diaphragm D. The bulbs *e* are mounted so as to touch the back of the diaphragm D, say, by the teat e^2, at which the exhausting-tube was sealed off, or otherwise, in order that the bulb shall participate as fully as possible in the vibrations of the diaphragm. The bulb-holders l^2 are connected by wires 1 1, 2 2, 3 3 on the one hand with the batteries B' B^2 B^3 and on the other with the primary windings p' p^2 p^3 of the induction-coil C, switches m' m^2 m^3 being provided, whereby any one or more of the microphones may be cut out, as required.

In shunts 1' 1', 2' 2', 3' 3' to the microphones is placed a siren-call device, being a make-and-break formed by a toothed wheel N and spring-contacts n n' n^2 n^3, connected to the respective members of the shunt-circuits. The wheel may be rotated by a handle n^4, so that by rapidly making and breaking the circuits of all the batteries simultaneously the diaphragm of the receiver will be caused to produce a siren call. The wheel N has a segment n^5 of insulating material, which is brought opposite to the spring-contacts by the weight of the handle n^4, whereby the short circuit through the call device is automatically broken.

O is a telephone switch-hook interposed between the batteries and the induction-coil having a multiple switch, whereby the circuits through the several primary windings of the coil and the circuit of the receiver-battery are automatically completed when the receiver is taken off the hook. The switches are formed of insulated metal rings o' o^2 o^3, each of which makes contact with a pair of springs connected to the respective members of the circuits.

The induction-coil C has, as above mentioned, as many independent parallel primary windings p' p^2 p^3 as there are microphones in the transmitter, each in circuit with a microphone and with its own battery, as above described. By the employment of independent multiple primary circuits the current-power in watts may be increased in order to obtain with a small coil the inductive action required for very long distance telephony, the resistance of the primary circuit being correspondingly decreased. The coil has a single secondary winding *s*, common to all the primary windings, and in connection with the line L. The induction-coil has a core formed of segmental bundles *c* of shellac-coated soft-iron wires, the bundles being insulated by being wrapped in shellac-coated paper to prevent self-induction and Foucault currents. The ends of the wires project beyond the ends of the coil and are bent outwardly from the center and form divergent brush-like poles *c'*, which have the effect of facilitating the magnetic discharge of the core and so diminishing retardation, and consequently increasing the loudness and clearness of articulation in the receiver.

The receiver R is provided with an electromagnet instead of the usual permanent magnet, the core *r* of the electromagnet being laminated or formed of strips of soft sheet-iron superposed and separated by intervening strips of shellac-coated paper, the superposed strips being bent to ⌊ shape and united by heating sufficiently to soften the shellac after bending. The limbs of the core are provided with two sets of coils *t t* and *u u*, the latter being in circuit with the line L and the former in connection with a local battery V, whose circuit is closed through the coils *t t* by the contact *t'* of the hook-switch O at that end of the line when the receiver is removed from the hook. By substituting an electromagnet for a permanent magnet the magnetism in the receiver may be increased to any required extent, so as to enable the weight of the magnet-core and diaphragm to be made as nearly as possible equal, and consequently the sensitiveness of the instrument to be greatly increased. The diaphragm *w* is clamped between the front and back covers of the case in the usual way.

I claim—

1. In a telephone-transmitter the combination of a plurality of microphones each formed of carbon pencils in parallel bound together so as to vibrate in unison and hermetically sealed within an exhausted bulb mounted on the diaphragm of the transmitter, the microphones being connected in parallel with as many batteries and with the pri-

mary windings of an induction-coil comprising as many parallel primary windings as there are microphones substantially as specified.

2. In a telephone-transmitter the combination of a plurality of microphones *in vacuo* and of an induction-coil having a plurality of independent parallel primary windings each in circuit through a switch with an independent microphone and a battery as specified, and of a make-and-break formed of a rotary toothed contact-wheel having an insulating segment, and of spring-contacts in shunts to the several microphones substantially as and for the purpose specified.

3. In a telephonic apparatus, the combination of a diaphragm, a plurality of transmitters mounted thereon, each comprising an exhausted vessel and a microphone vibratorily mounted therein and each in circuit with a separate battery, an induction-coil having as many parallel primary windings as there are microphones, a battery in circuit of each primary winding and microphone, and a single secondary winding to the induction-coil connected to a line, as specified.

4. In a telephone-transmitter the combination, with the diaphragm and with the walls of the case, of an attached lining of granular non-hygroscopic material as and for the purpose specified.

5. In a telephonic instrument, the combination of a diaphragm, oppositely placed, springy conducting-holders carried thereby, a hollow body, a microphone carried therein, and terminals on the hollow body engaging the conducting-holders so that the holders support the hollow body and conduct current thereto.

6. The combination in a telephonic instrument of a sealed hollow body, a microphone contained therein, and having terminals at opposite ends of the said hollow body, a diaphragm, and a plurality of oppositely-placed conducting-supports mounted on the diaphragm and adapted to grasp the hollow body to support it between them so that the diaphragm will vibrate the hollow body.

7. In a telephonic instrument, the combination of a closed hollow body, a microphone contained therein, terminals on the hollow body, a diaphragm, supporting-terminals carried on the diaphragm and supporting the microphone between them, and a projection on the hollow body reaching contact with the diaphragm, whereby the diaphragm will be effective to bodily vibrate the hollow microphone-containing body.

8. In a telephonic instrument, the combination of a diaphragm, a vibratory hollow body containing a microphone and supported at or near each end from the diaphragm and provided with a projection intermediate of its ends reaching contact with the said diaphragm, substantially as described and for the purposes set forth.

PAUL DE KILDUCHEVCKY.

In presence of—
COLIN C. M. GIBSON,
JAMES CONWAY.