

(No Model.)

F. L. CAPPS.
TELEPHONE.

No. 441,396.

Patented Nov. 25, 1890.

Fig 1.

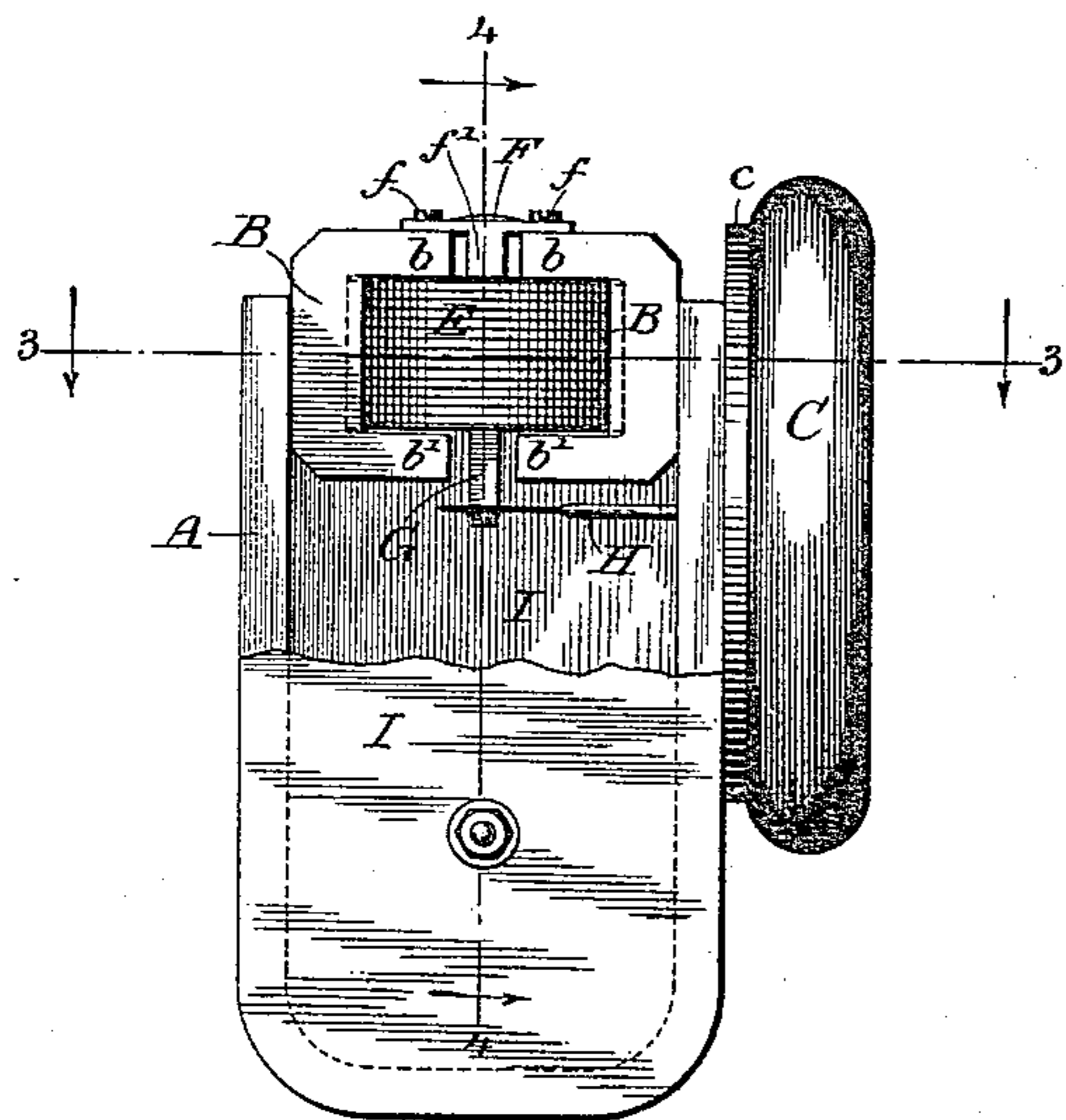


Fig 2.

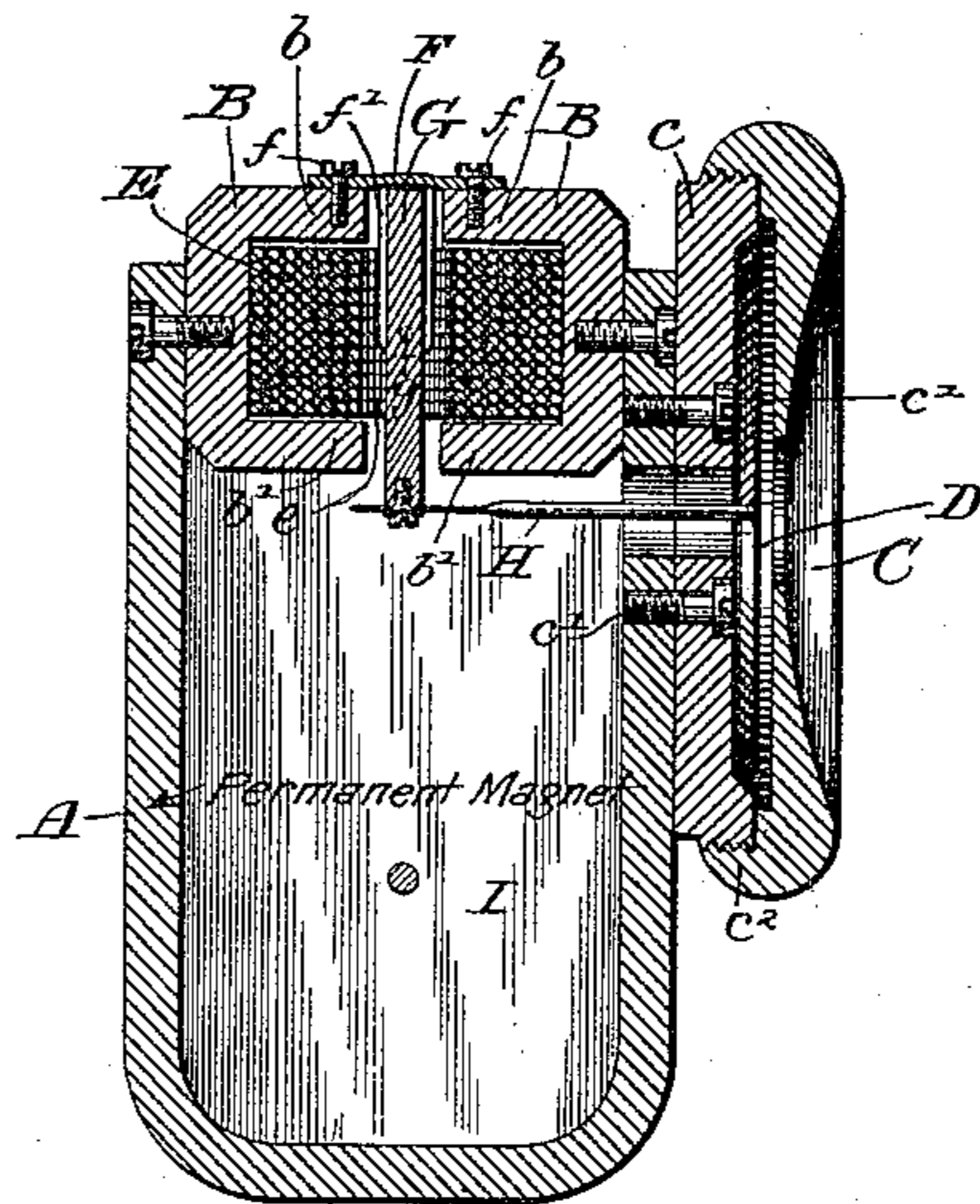


Fig 3.

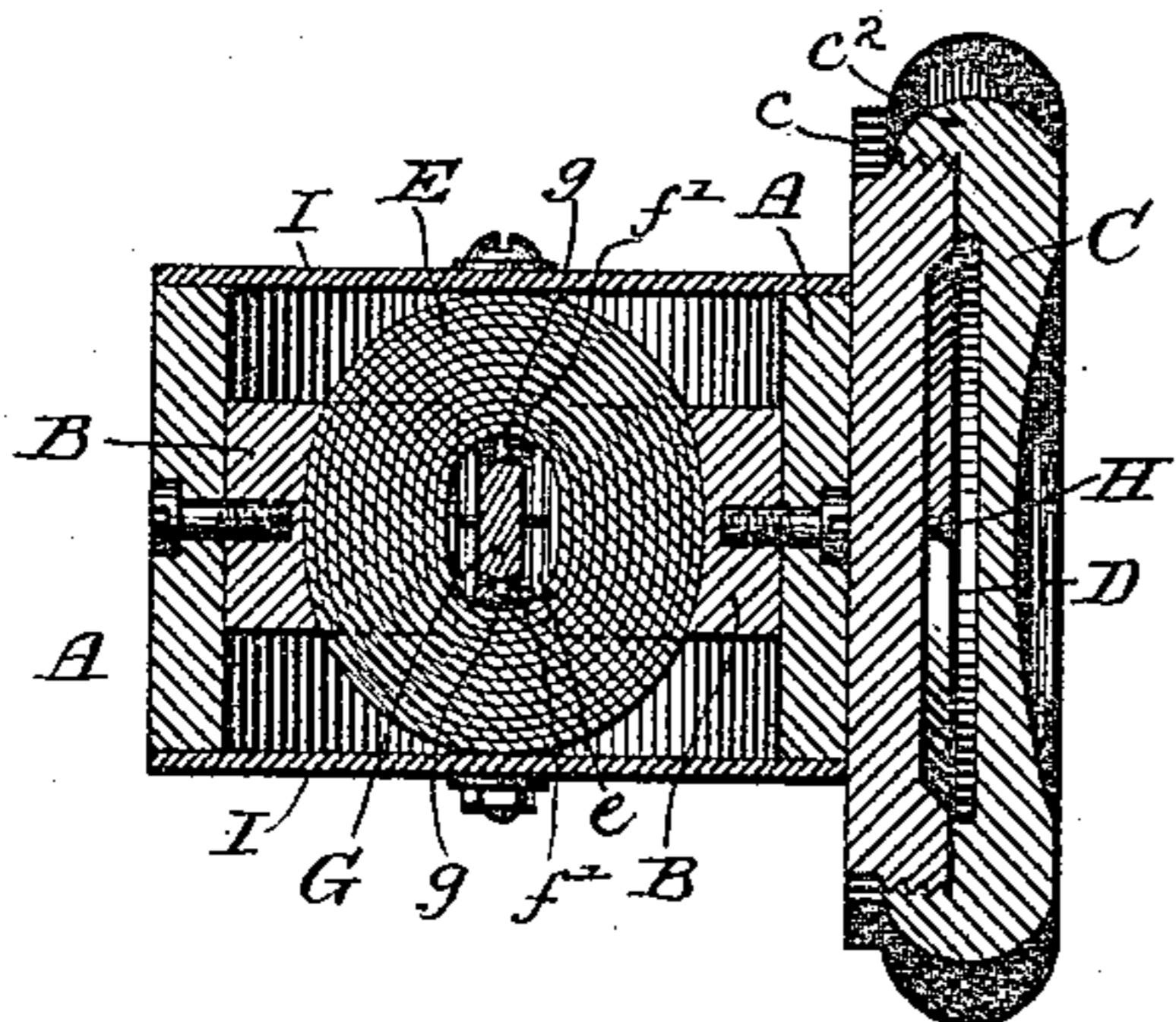
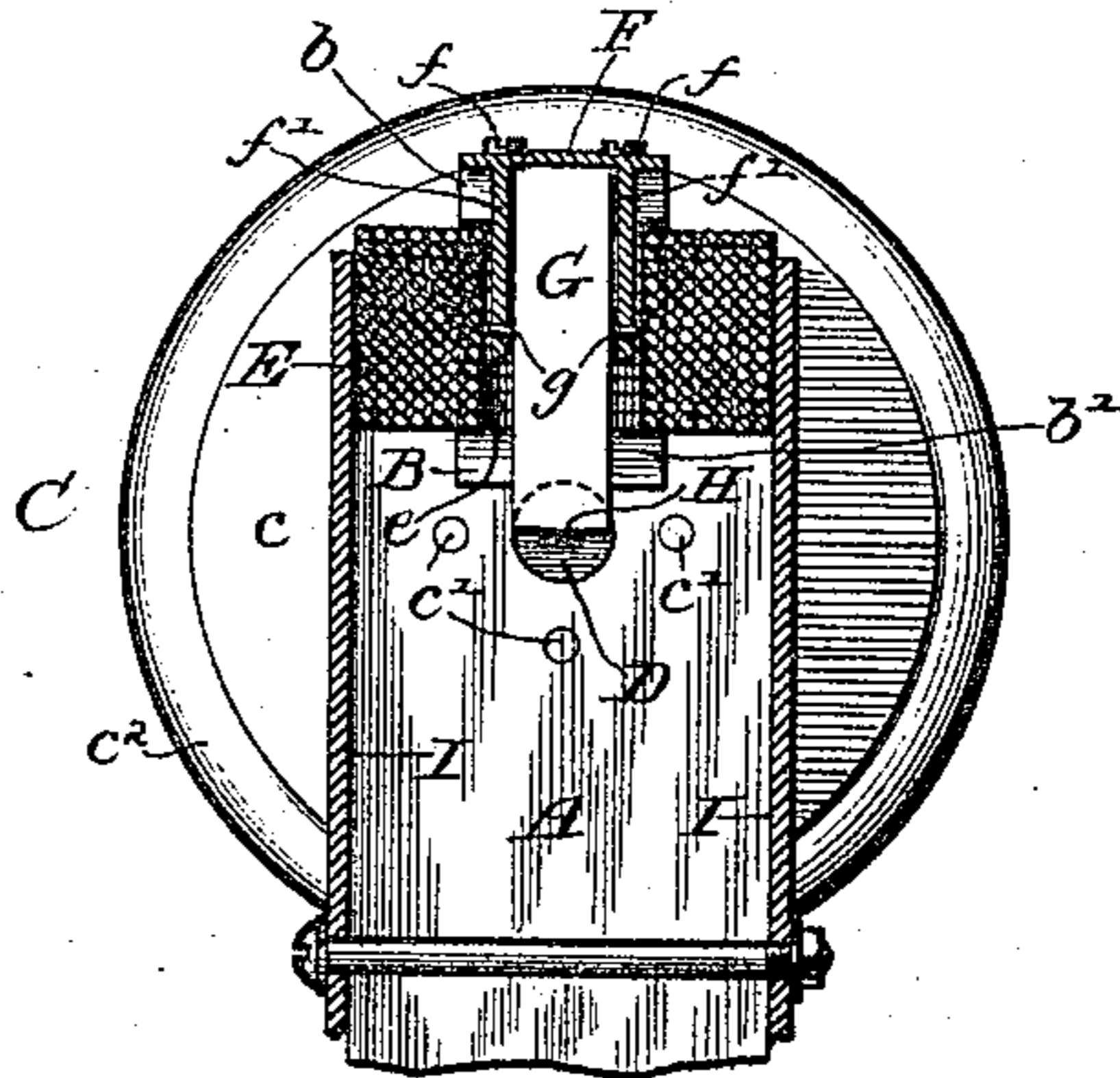


Fig 4.



Witnesses

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UNITED STATES PATENT OFFICE.

FRANK L. CAPPS, OF SPRINGFIELD, ILLINOIS, ASSIGNOR OF ONE-HALF TO
ALBERT L. IDE, OF SAME PLACE.

TELEPHONE.

SPECIFICATION forming part of Letters Patent No. 441,396, dated November 25, 1890.

Application filed April 7, 1890. Serial No. 346,814. (No model.)

To all whom it may concern:

Be it known that I, FRANK L. CAPPS, of Springfield, in the county of Sangamon and State of Illinois, have invented certain new and useful Improvements in Telephones; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to telephones or appliances for electrically receiving, conveying, and audibly delivering articulate and other sounds, and more particularly to what are known as "receivers" by which the sounds are audibly delivered.

The object of my invention is to provide a telephonic receiver which shall with loudness and distinctness deliver the articulate or other sounds which are electrically transmitted to it.

To the above purpose my invention consists in certain novel features of construction, as hereinafter described, and pointed out in the appended claims.

In order that my invention may be fully understood, I will proceed to describe it, having reference to the accompanying drawings, in which—

Figure 1 is a side elevation of a receiver constructed in accordance with my invention, certain parts being broken away to more clearly show the structural arrangement. Fig. 2 is a longitudinal section of the same through the center of the diaphragm-case or ear-piece. Fig. 3 is a transverse section of the same on the line 3 3 of Fig. 1 and looking in the direction indicated by the arrows on said line. Fig. 4 is a sectional view on the line 4 4 of Fig. 1, looking in the direction of the arrows on said line.

In the said drawings, A designates a permanent magnet of horseshoe form, the extremities or poles B of which are forked to form oppositely-arranged prongs $b b b' b'$, which extend laterally toward each other, as shown.

C designates the diaphragm-case or ear-piece, which is composed of a backing c , secured upon the outer side of one arm of the magnet A by screws c' and having a screw-

threaded rim, upon which the internally-threaded rim c^2 of the cap C is secured. This arrangement is the preferred one, but is not material to my invention, and may be varied without departing from the essential spirit of the same.

D designates the diaphragm, which is shown as confined at its margin between the rims of the backing and cap of the case or ear-piece, so as to vibrate at its center freely therein in the usual manner.

E designates a coil of insulated wire, which is hollow or has a central opening e , and which is suitably secured between the forks B and the prongs thereof, so that its central axis shall extend parallel with the arms of the magnet A. Upon the adjacent ends of two of the prongs $b b$ of the forks B is secured a plate F, attached in position opposite the central opening of the coil by screws f or other suitable means. At the center of the plate F are attached two arms $f' f'$, which extend parallel with each other into the opening e to a point midway of the length of the same.

G designates a bar, preferably of soft iron, which constitutes the armature of the receiver, and which extends through the opening e , and which is pivoted midway of its length between the lower extremities of the arms $f' f'$, as indicated at g . The opposite ends of this bar G are located between the prongs $b b b' b'$ of the forks B, and one of its ends which extends past or outside of the prongs $b' b'$ is pivotally connected with the inner end of a rod H. This rod extends at right angles to the armature G through one arm of the magnet, as shown, and its outer end is suitably secured to the center of the diaphragm D.

In order to protect the various working parts of the receiver, they are preferably inclosed in a casing—such, for example, as is formed by the plates I—which are suitably bolted or otherwise secured against the side edges of the magnet A, so as to protect the working parts, the lower part or bend of the permanent magnet serving as a convenient handle when placing the receiver against the ear. The coil E is placed in circuit with the line-wire, and when a current or electrical

impulse is sent through the coil E it magnetizes the armature G, making the same of north polarity at one end and of south polarity at the opposite end. The prongs *b b'* of the forked pole-pieces B being of opposite polarity those opposite that end of the armature which is of north polarity will operate one to repel and the other to attract that end of the armature. Similarly one of the poles will repel and the other will attract the opposite end of the armature. It follows that in the passage of an undulating current through the coil the armature will be attracted with a force equal to the repulsion and attraction of all four of the pole-pieces, and that the vibratory motion thus produced will be transmitted through the bar H to the diaphragm and thence to the ear. It is obvious that the above construction will cause the articulate or other sounds to be reproduced with great force and distinctness, owing, mainly, to the attractive action of the polarized armature upon the prongs of the magnet, and this result is obtained when only two opposite prongs are used as well as when four are present. The employment of the four prongs, as shown, is preferred, however, because in this construction the attractive and repulsive force of both ends of the polarized armature is utilized.

The diaphragm in the instrument described may be made of non-magnetic metal or of non-metallic substances, the use of a magnetic metal not being necessary, as is the case in telephones in which the diaphragm acts as an armature. It may in some instances be found advantageous to use a material other than magnetic metal for the diaphragm—as, for instance, aluminum may be found to be of advantage by reason of its lightness, or gold or other metals by reason of their ductility or other qualities by which more perfect results may be produced. In telephones having diaphragms of magnetic material, furthermore, the necessary proximity of the diaphragm to the pole of the magnet limits the range of vibration of the armature and necessitates a restricted movement thereof. In the construction herein shown the diaphragm may be made of much larger size and with a wider range of movement than in such telephones having diaphragms of magnetic metal with obvious advantages in point of fullness or loudness of tone in the instrument. By reason of the great power exerted by the attractive action of the polarized armature upon the poles of the magnet and the increased range of movement which may be given to the diaphragm an instrument constructed as proposed by me will transmit audibly with a light current or through a great distance, and will therefore be of great utility for long-distance transmission.

It is obvious that the instrument may be used as a transmitter, for the reason that when speaking against the diaphragm the vibration thereof causes a movement of the ar-

mature, thus inducing a current or electrical impulses in the coils, which will be transmitted over the line. The instrument will thus be equally advantageous for use as a receiver, the magnet having an intensifying action upon the polarized armature and through the same upon the coils. Such intensifying action will be fourfold in case the polarized armature is hung centrally with both of its ends between opposite polar projections, as in the construction illustrated in the drawings. I do not, therefore, wish to be understood as confining my invention to any mere details of construction, because such details may be varied, and are varied by me, without departure from the essence of my invention.

I claim as my invention—

1. The combination, with a permanent magnet, of a vibrating armature interposed between the poles of a magnet and a stationary coil connected in the line-circuit and surrounding the said vibrating armature with its axis arranged longitudinally relatively to the armature, substantially as described.
2. The combination, with a permanent magnet and a diaphragm mounted thereon, of a vibrating armature interposed between the poles of the magnet and connected with the diaphragm and a stationary coil connected in the line-circuit and surrounding said vibrating armature with its axis arranged longitudinally relatively to the armature, substantially as described.
3. The combination, with a permanent magnet provided with oppositely-arranged forked arms or pole-pieces, of a vibrating armature interposed between the said forked pole-pieces and a coil connected in the line-circuit and surrounding said armature, substantially as described.
4. The combination, with a permanent magnet having forked arms or pole-pieces, of an armature pivotally supported between its ends between the said pole-pieces and a coil connected in the line-circuit and surrounding said armature, substantially as described.
5. The combination, with a permanent magnet provided with forked arms or pole-pieces and a diaphragm mounted on the said magnet, of a vibrating armature interposed between the said pole-pieces and connected at one end with the diaphragm and a stationary coil in the line-circuit surrounding said vibrating armature with its axis arranged longitudinally relatively to the armature, substantially as described.
6. The combination, with a permanent magnet, of a diaphragm, an armature interposed between the poles of the magnet, a stationary coil connected in the line-circuit and surrounding said vibrating armature with its axis arranged longitudinally relatively to the armature, and a rod connecting one end of the armature with the said diaphragm, substantially as described.
7. The combination, with a permanent mag-

net and a diaphragm, of a vibrating armature
interposed between the poles of the magnet
and connected with the diaphragm, a coil con-
nected in the line-circuit and surrounding
5 said armature, and a plate attached to the
magnet and having arms extending into the
coil to afford pivotal support for the said ar-
mature, substantially as described.

In testimony that I claim the foregoing as
my invention I affix my signature in presence of
two witnesses.

FRANK L. CAPPS.

Witnesses:

A. L. IDE,
H. L. IDE.