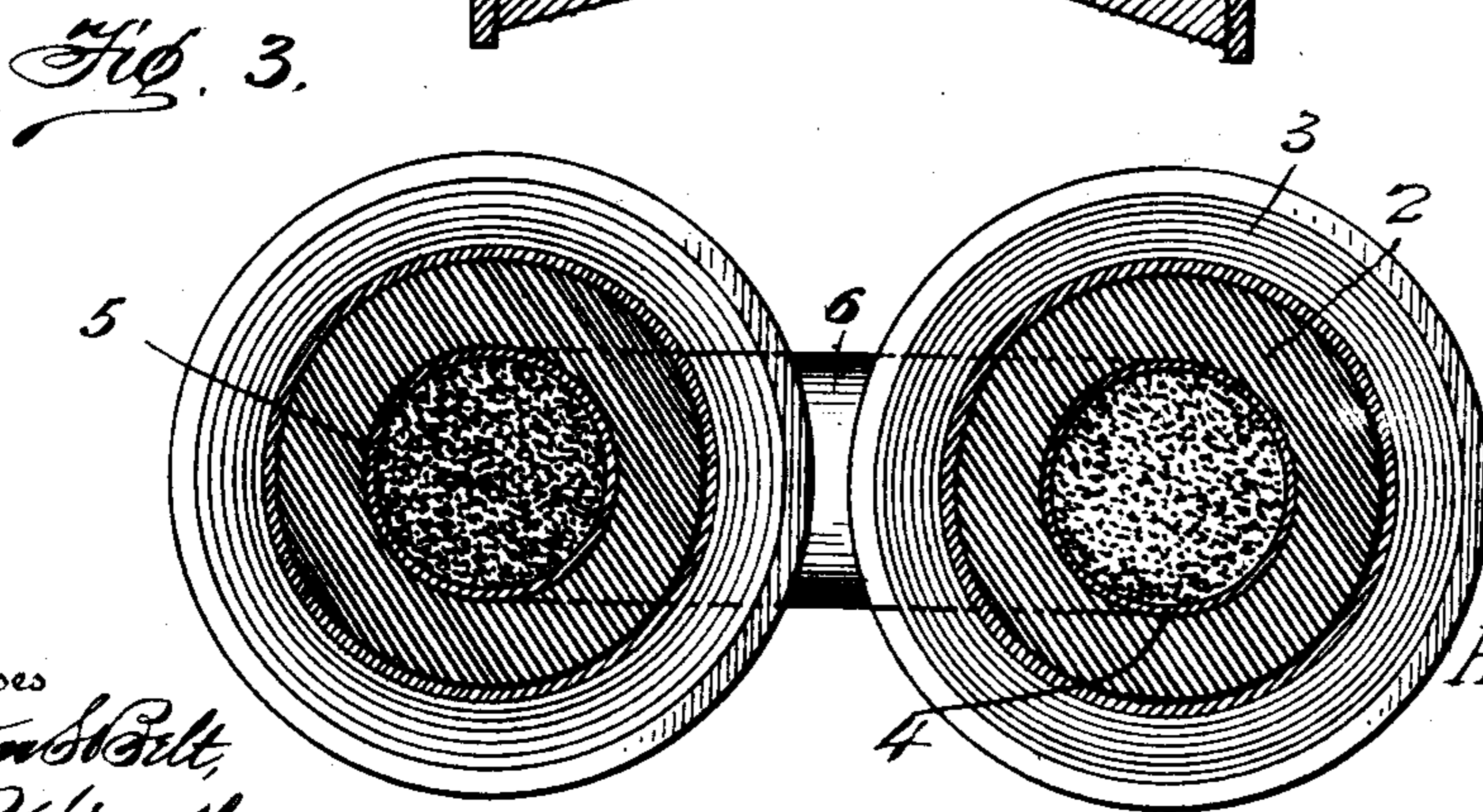
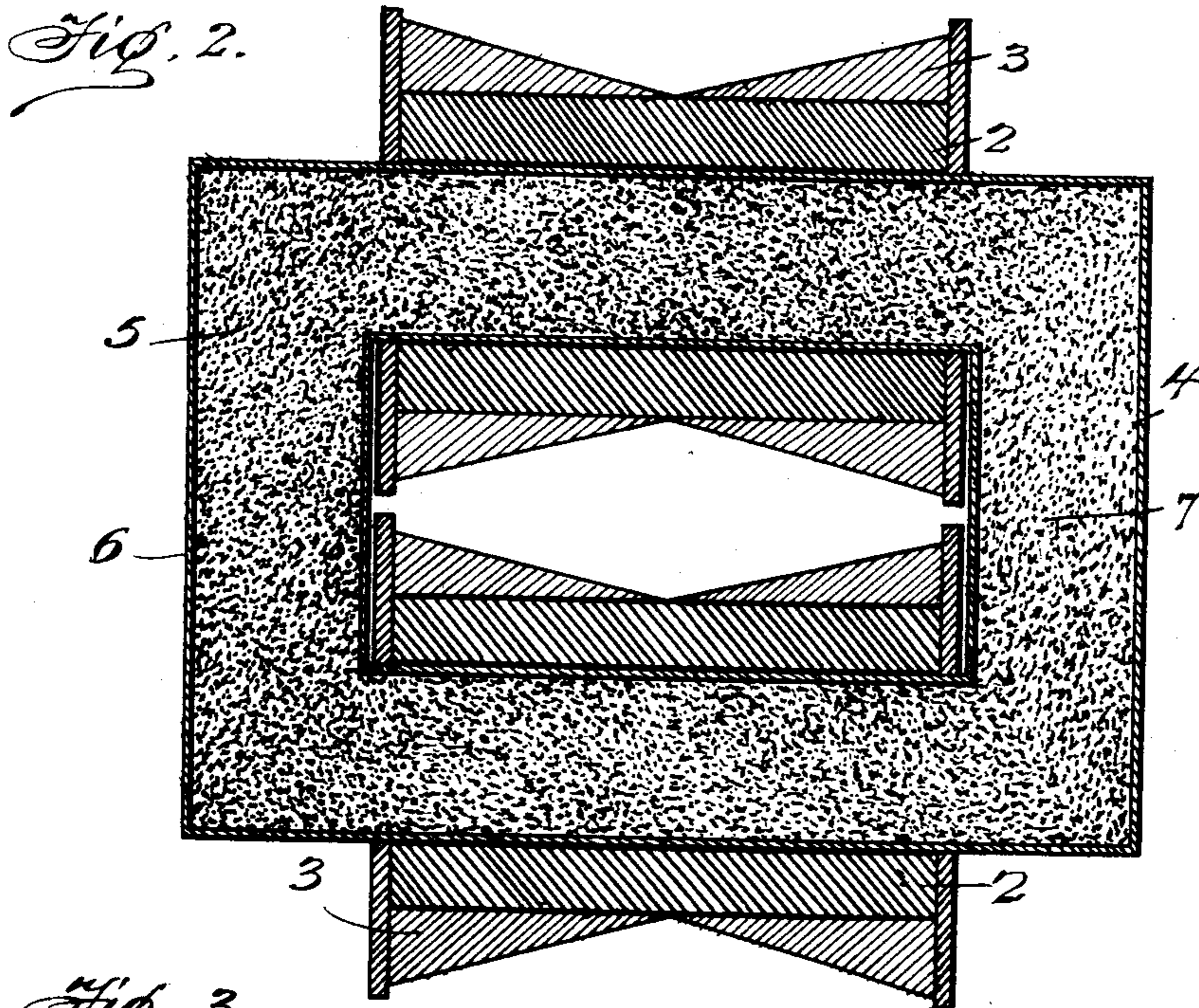
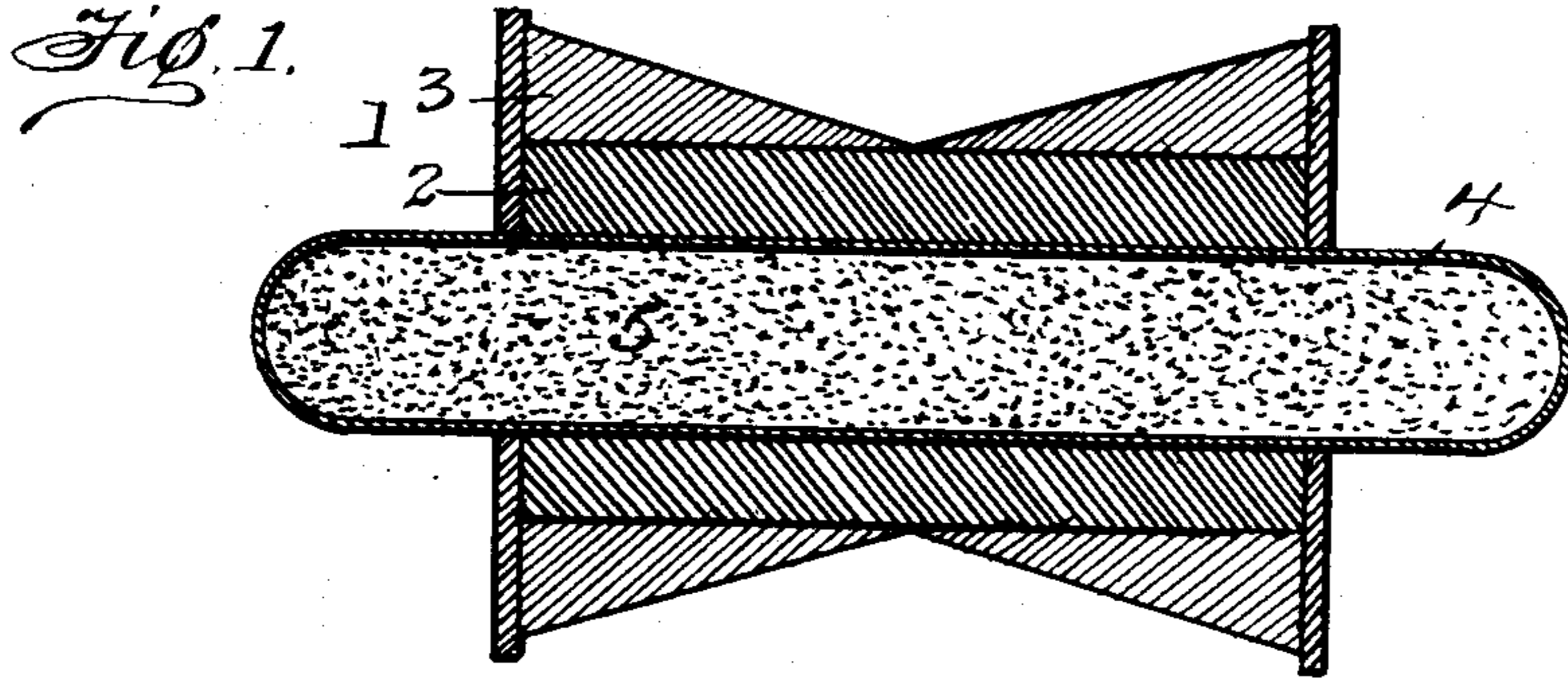


H. LIEBREICH.
TELEPHONE TRANSFORMER.

(Application filed Nov. 30, 1900.)

(No Model.)

2 Sheets—Sheet 1.



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H. LIEBREICH.
TELEPHONE TRANSFORMER.

(Application filed Nov. 30, 1900.)

(No Model.)

2 Sheets—Sheet 2.

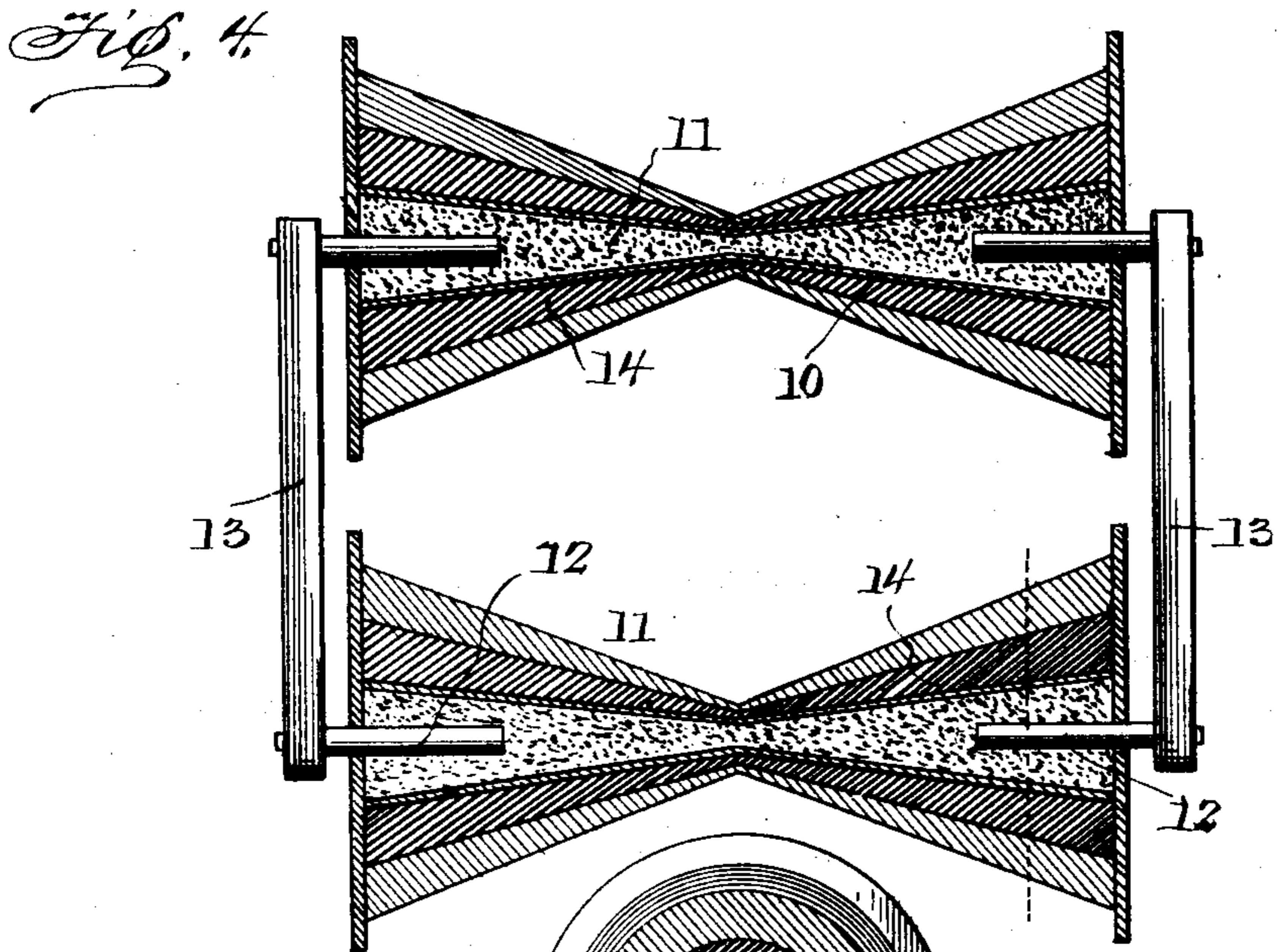
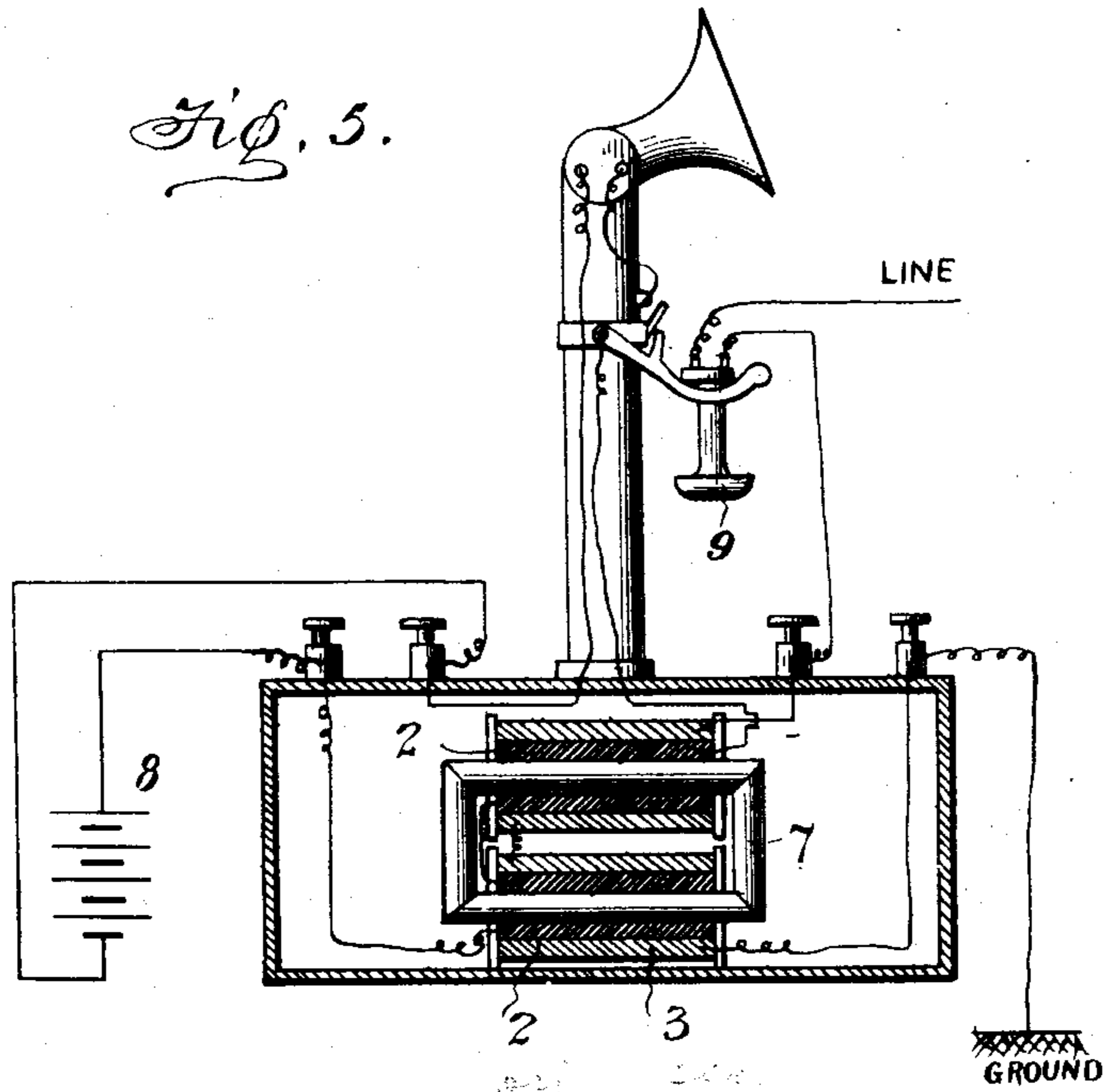
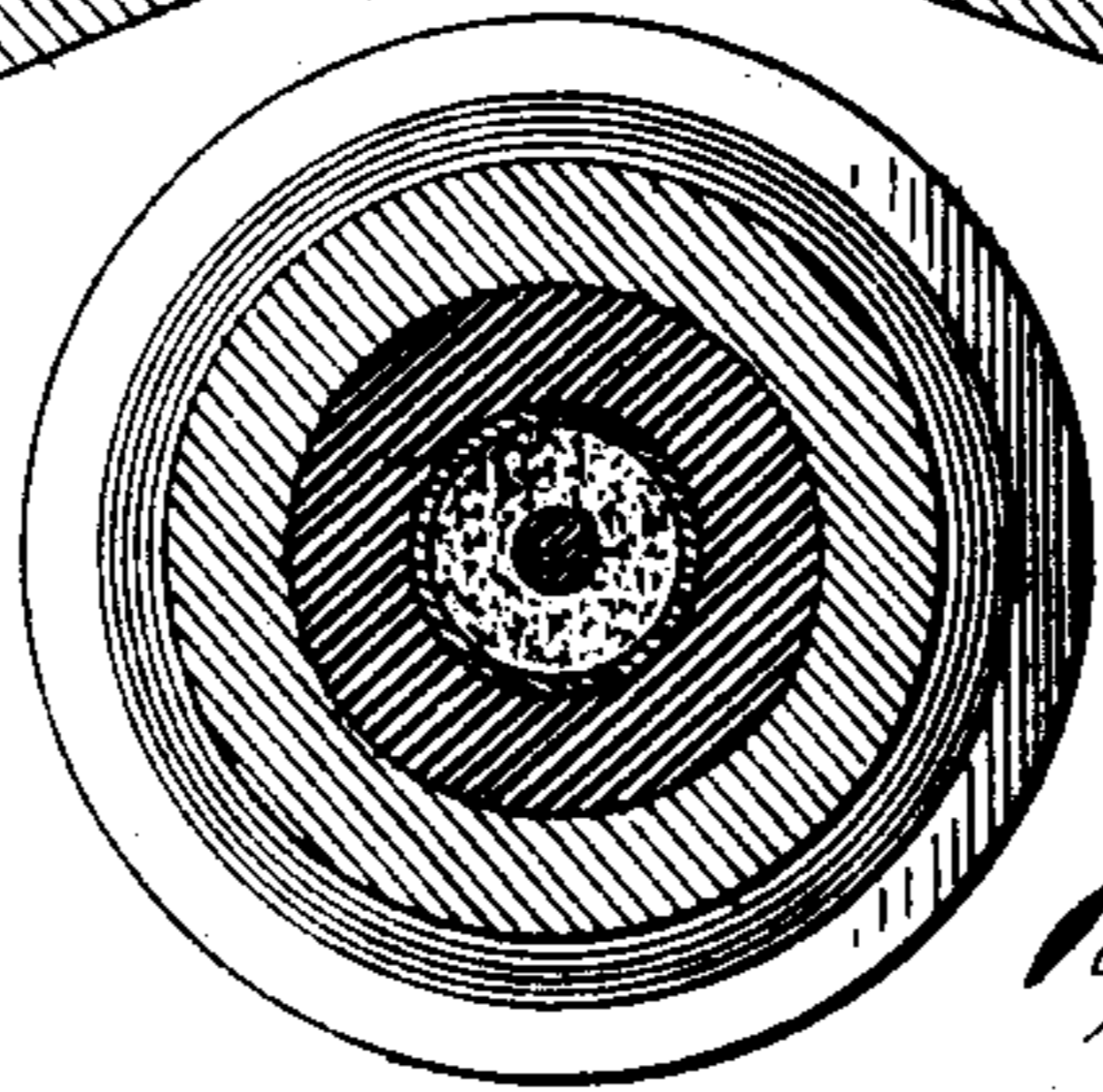


Fig. 6.



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UNITED STATES PATENT OFFICE.

HANS LIEBREICH, OF DETROIT, MICHIGAN, ASSIGNOR TO FREDERICK ROHNERT, OF SAME PLACE.

TELEPHONE-TRANSFORMER.

SPECIFICATION forming part of Letters Patent No. 683,954, dated October 8, 1901.

Application filed November 30, 1900. Serial No. 38,199. (No model.)

To all whom it may concern:

Be it known that I, HANS LIEBREICH, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Telephone-Transformers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in apparatus for increasing the sensitiveness of telephone instruments and the power with which impulses, tones, or signals are reproduced over the same.

It consists in a mechanism comprising one or more induction-coils having a primary and secondary winding, cores mounted within the coils and formed of casings filled with comminuted iron filings or dust, and bars connecting the ends of the cores outside the coils, and means for connecting the primary winding of the induction-coil with transmitting instruments and a source of electrical energy and the secondary coil with receivers.

It further consists in an induction-coil made up of primary and secondary windings, the secondary winding being diminished in resistance opposite its neutral point, a core for the said coil made up of a hollow casing, a filling of iron-dust, and short sections of small iron wires compressed under hydraulic pressure to form a solid mass, bars connecting the ends of the said cores formed of hollow casings also filled with compressed iron-dust and short iron rods, and means for connecting the induction-coil with the rod.

It also consists in certain other novel constructions, combinations, and arrangements of parts, as will be hereinafter more fully described and specifically claimed.

In the accompanying drawings, Figure 1 is a longitudinal central section through my improved apparatus for increasing the sensitiveness of telephones. Fig. 2 is a horizontal central section through the same. Fig. 3 is a transverse cross-section through the coils of the instrument. Fig. 4 is a horizontal central section through a coil having a modified core connection, and Fig. 5 is a diagrammatic

view showing the manner of connecting the instrument with a telephone-line.

My improved apparatus is designed to be connected up with the receivers and transmitters of a telephone-line, so that it will increase the sensitiveness of the reproductions produced at the receivers.

The invention resides, chiefly, in the construction of an induction-coil 1, which is employed as a transformer and is provided with a primary winding 2 and a secondary winding 3. While I may employ only one such coil, I preferably arrange two coils side by side and connect their cores together to form a single instrument. The cores of the said coils are formed of hollow casings, as 4 4, which are designed to be filled by finely-comminuted pieces of soft iron. While very fine iron-dust is found to be sufficient for this purpose, I preferably form the core-filling of a series of short sections of iron wire, as 5 5, the interstices between the same being filled with fine iron-dust and the whole mass being compressed under hydraulic pressure to form a solid mass. The cores may be connected at their ends by any suitable bars, as 6 6; but I preferably form the said bars in the same manner in which the cores are formed—namely, in hollow casings 7, filled with small pieces of iron rods and iron-dust closely packed together. As seen in Fig. 5 of the drawings, the primary coils 2 2 are connected with a battery 8 and a receiver 9, while the secondary coil 3 is connected with the line-receivers. I find in use that when varied impulses are sent through the primary windings of the coils by means of the transmitters and the batteries that the vibrations of the particles in the cores incite currents in the secondary windings of high tension, so that the impulses started at the transmitters are reproduced with loudness and distinctness at the receivers. I preferably reduce the resistance of the secondary coils opposite their central or neutral points by diminishing the winding of the wire at that point and increasing the same gradually to points opposite their poles. I may also vary the construction of the coils and their cores without departing from the spirit of the invention. As seen in Fig. 4 of the drawings, for instance, the cores

10 may be formed of casings larger at their ends than at their centers, the reduction in size being made opposite the neutral points of the said cores and the cores being filled in
 5 this instance with the compressed iron rods and dust, as 11. Core pieces or poles, as 12 12, are inserted in the ends of the cores 10 and extend some little distance into the comminuted iron filling. The pole-pieces 12 12
 10 are preferably connected with bars 13 13, which may be made of soft iron, if desired. The cores 10 10 are surrounded by primary windings 14 14, also diminished in size at their central points, and an outer winding or secondary coil is placed outside the primary coil, it being also reduced in thickness opposite the central point of the coil. This construction of core and coil, having large ends to form strong poles and reduced central portions to diminish the resistance, produces induction-coils of great power and little resistance. In coils of the construction just described the primary windings are connected with the receivers and batteries of the line, as above set forth,
 25 and the line-wires and the receivers are alone connected with the secondary windings. It will thus transpire that only the induced impulses of high tension are transmitted to the receivers and powerful and distinct results
 30 are delivered at the same.

The principal feature of this invention is the construction of the cores with the fine particles of soft iron, and in these cores the vibrations of the molecules or atoms of iron
 35 produce the induced currents in the secondary coils. The construction is simple and yet very effective and capable of improving the action of telephone-lines.

In forming a mixture for the cores of the
 40 induction-coils I also contemplate mixing the short iron wires with oxid of iron when desired, as well as with iron-dust. In making any one of the mixtures referred to for the core-filling any suitable adhesive material
 45 may be mixed with the iron wires or iron-dust to more perfectly hold the mass together, all within the spirit of the present invention.

Having thus described my invention, what I claim as new, and desire to secure by Letters
 50 Patent, is—

1. An apparatus for increasing the sensitiveness for telephone systems comprising a coil having a primary and secondary winding adapted to be connected up with a telephone-
 55 line, a core for the said coil comprising a hol-

low casing, a compressed mass of finely-comminuted soft iron filling the said core for producing induced currents of high tension in the secondary winding of the said coil, substantially as described. 60

2. A transformer for telephones comprising coils having primary and secondary windings, cores in the said coils consisting of hollow casings, compressed fillings of comminuted particles of soft iron forming a solid
 65 mass, and means for connecting the primary wires with transmitters and batteries and the secondary wires with receivers, whereby the receivers will be operated by induced currents, from the secondary windings, of high
 70 tension, substantially as described.

3. A transformer for telephones, comprising a pair of coils having primary and secondary windings, cores extending through each coil, bars connecting the ends of the cores, a filling
 75 for the cores and the connecting-bars comprising short iron wires and iron-dust closely packed together, and means for connecting the primary and secondary coils with the telephone-line, substantially as described. 80

4. A transformer for telephones comprising coils having primary and secondary windings, cores mounted therein having fillings of comminuted pieces of soft iron and iron-dust, pole-pieces extending into the ends of the
 85 said cores, and bars connecting the said pole-pieces, substantially as described.

5. A transformer for telephones, comprising coils having primary and secondary windings, which are reduced in size at their centers
 90 opposite their neutral points, cores within the said coils also reduced at their neutral points, fillings of iron-dust in the coils, pole-pieces extending into the cores and bars connecting the same, substantially as described. 95

6. A transformer for telephones comprising an induction-coil having a primary and a secondary winding, a hollow core mounted within the same, a filling in the said core, consisting
 100 of a compressed mass of soft-iron wires mixed with oxid of iron, and bars connecting the poles of the cores outside the coils, substantially as described.

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

HANS LIEBREICH.

Witnesses:

JOHN L. FLETCHER,
 CASSELL SEVERANCE.