

No. 683,953.

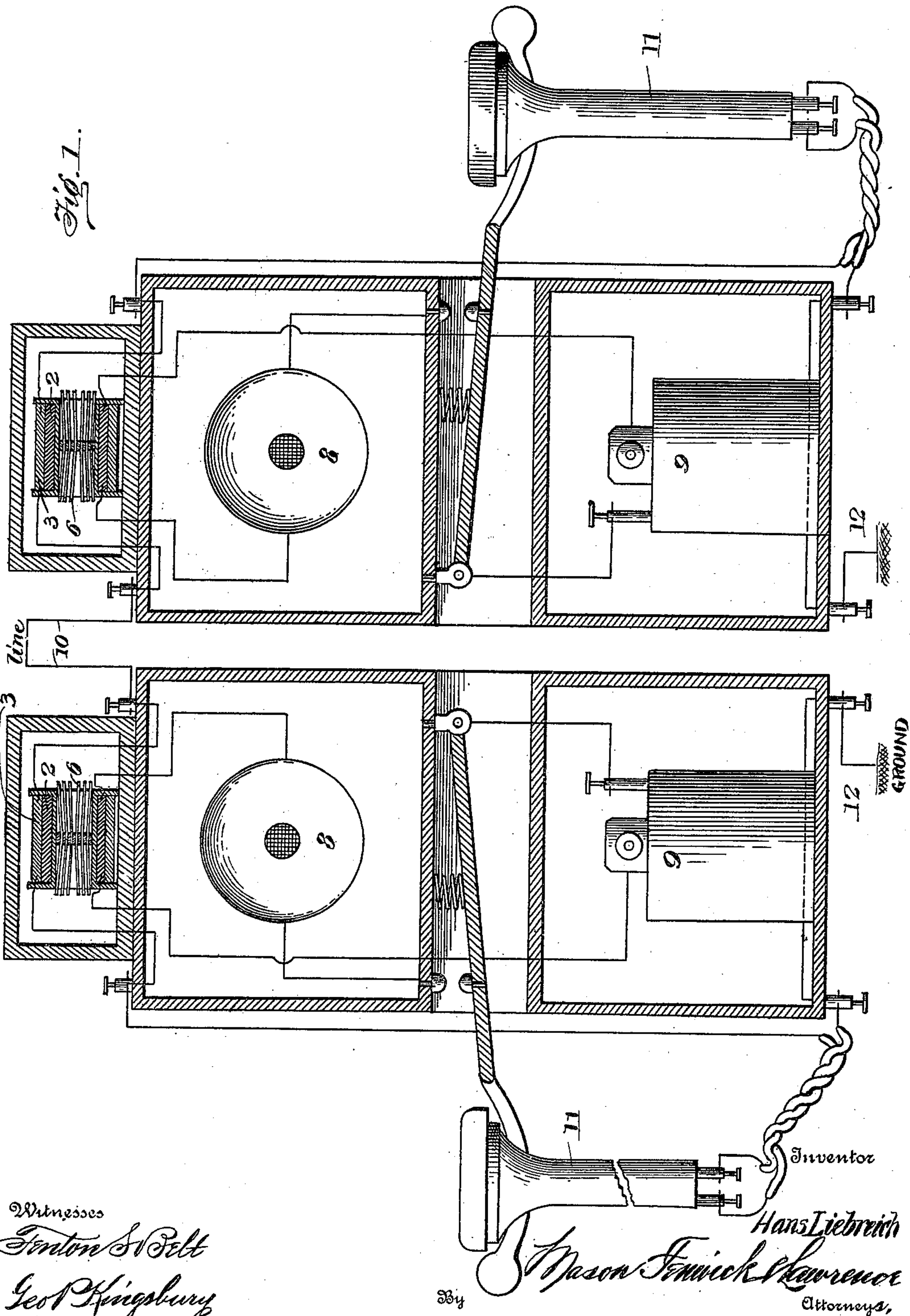
Patented Oct. 8, 1901.

H. LIEBREICH.  
TELEPHONE TRANSFORMER.

(Application filed Nov. 30, 1900.)

(No Model.)

2 Sheets—Sheet 1.



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Fig. 2.

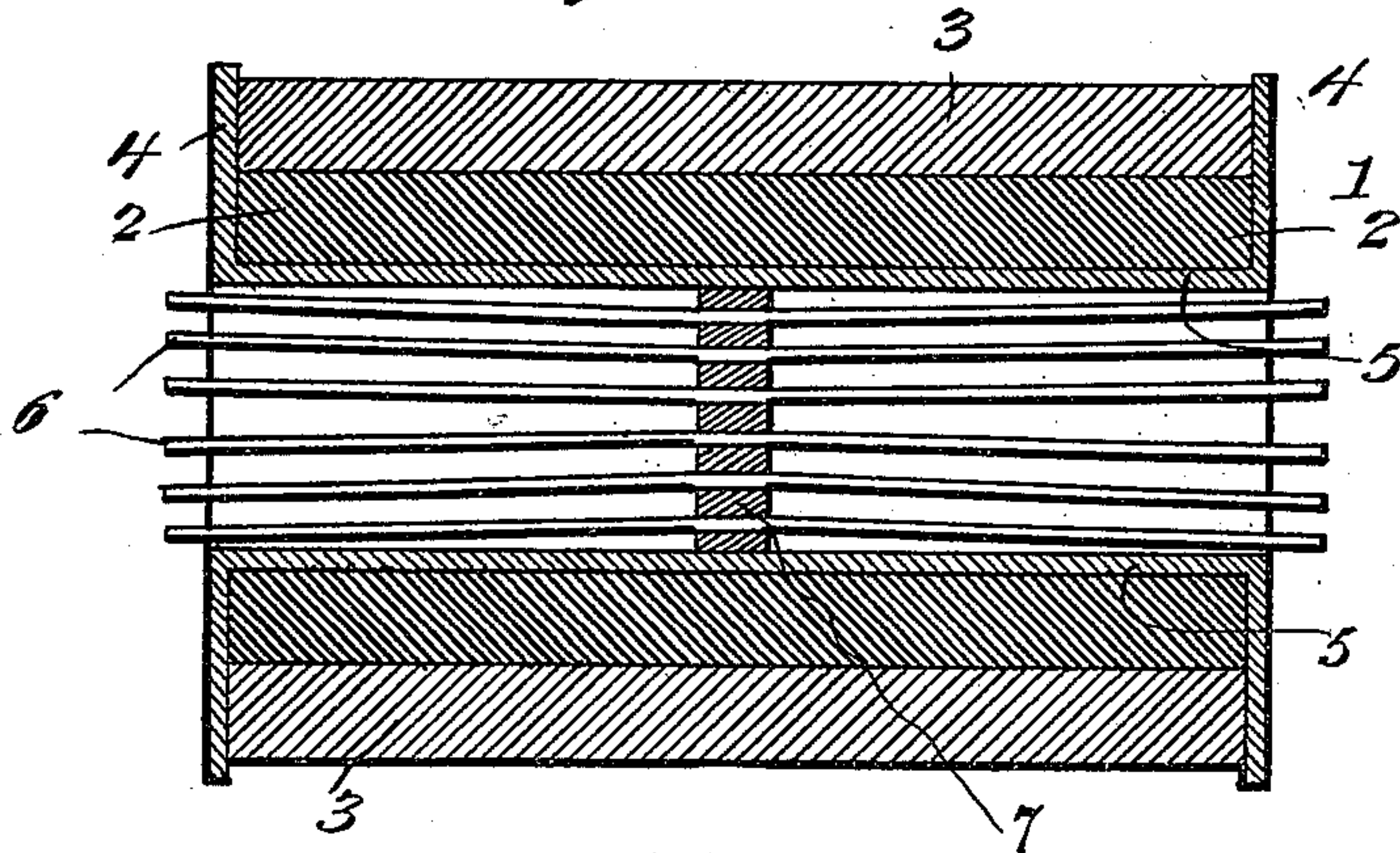


Fig. 3.

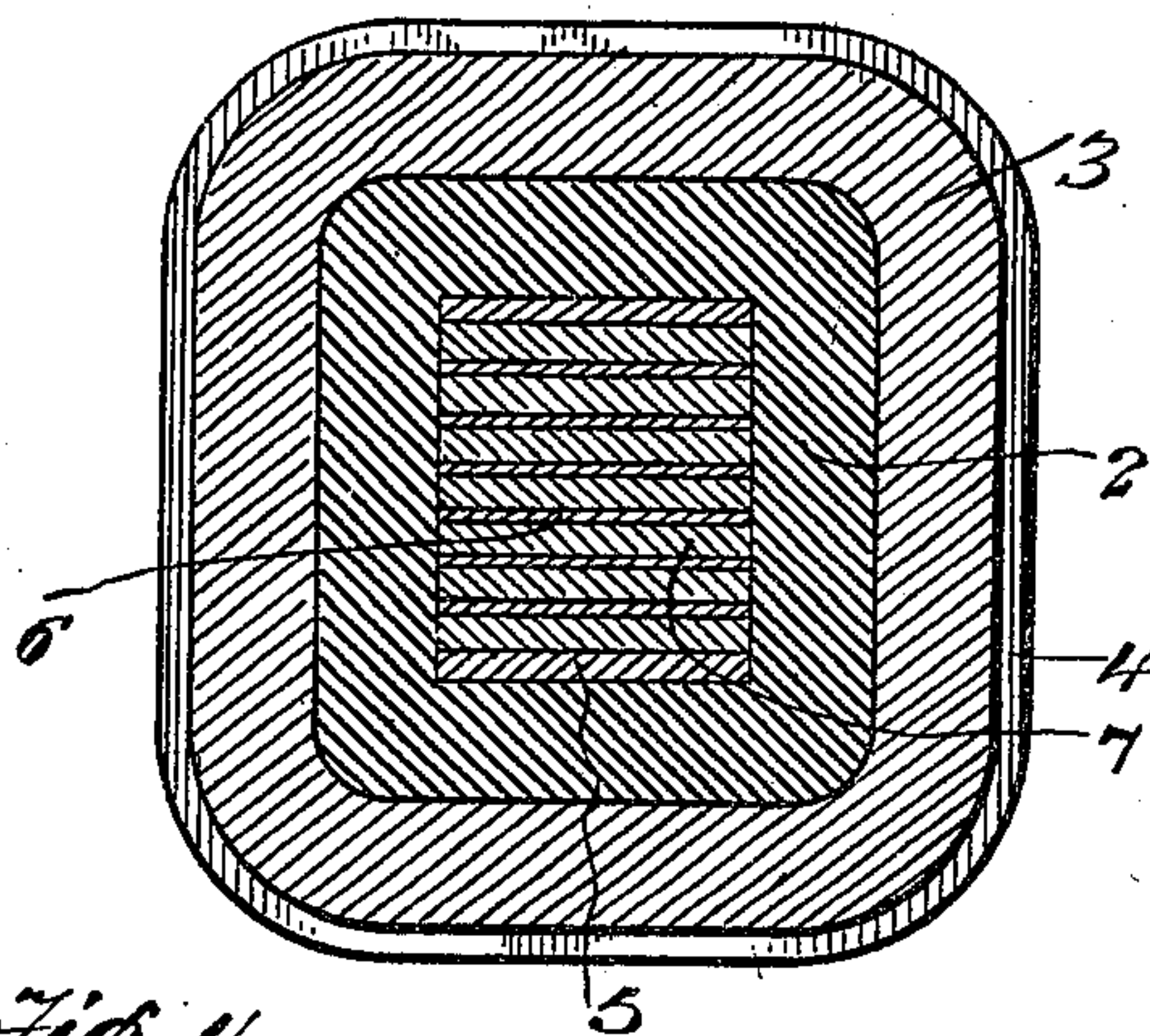
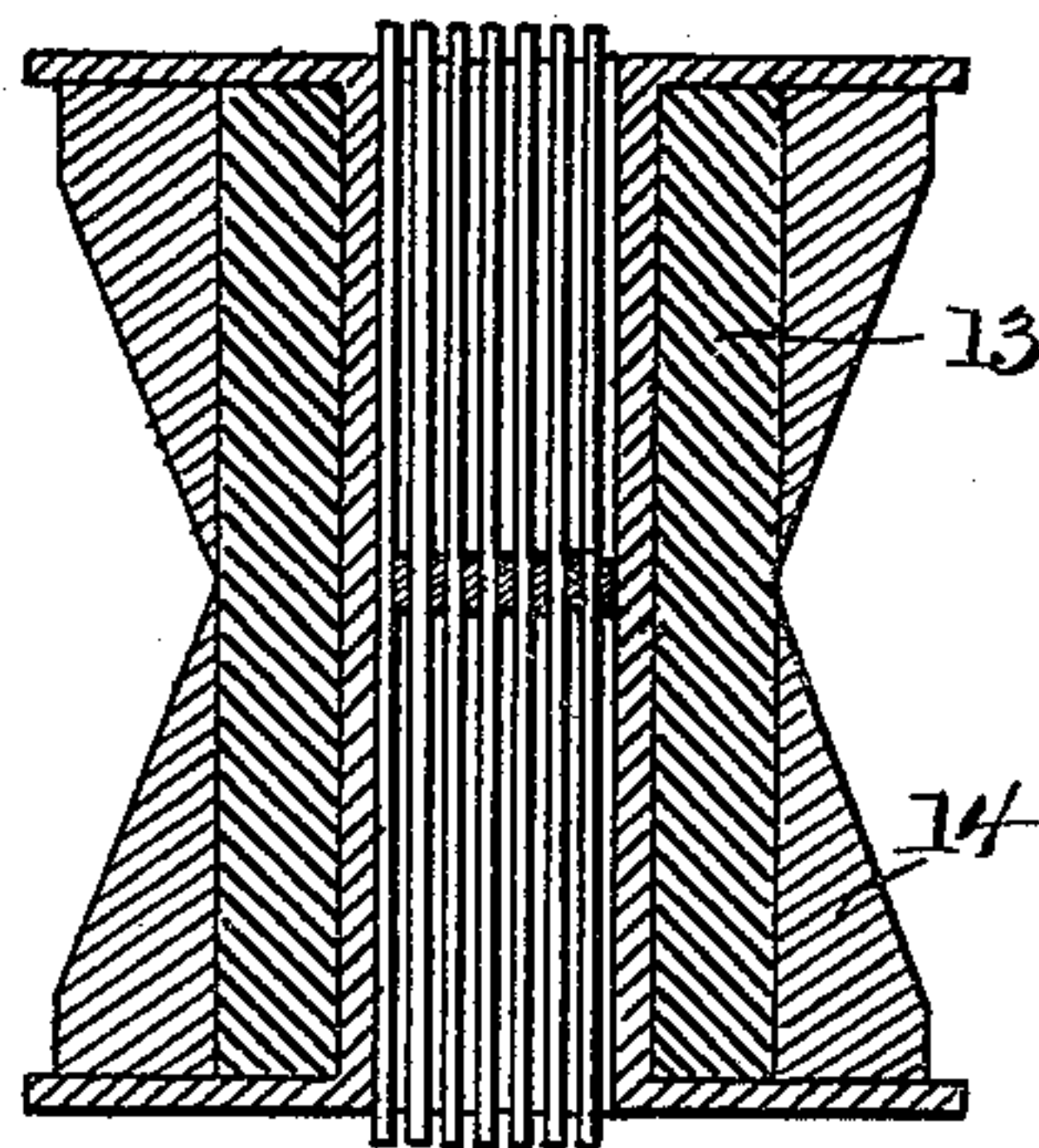


Fig. 4.



Witnesses

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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. 683,953, dated October 8, 1901.

Application filed November 30, 1900. Serial No. 38,194. (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 reproductive powers of telephones or other instruments employed for transmitting electrical impulses, sounds, and the like.

It consists in an apparatus comprising one or more coils having primary and secondary windings and provided with a core or cores comprising a series of flexible leaves or plates secured within the said coil or coils and having their outer ends free to vibrate with respect to the poles of the coil, together with means for connecting the primary windings with transmitters and batteries and the secondary windings with line-wires and receivers.

It further consists in a transformer for telephones comprising an induction-coil made up of a primary winding and a secondary winding, a core mounted therein and formed of a series of laminæ or leaves secured at their central points to holding means within the coil, the outer ends of the said leaves being free to vibrate in response to electrical impulses passed through the primary coil, and means for connecting the primary coil with a transmitter and a battery and the secondary coil with the line-wire and receivers, whereby the currents induced in the secondary coil by the vibration of the laminæ will augment the sounds reproduced in the receivers.

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

In the accompanying drawings, forming a part of this specification, Figure 1 represents an enlarged diagrammatical view of a telephone-line, showing the manner of connect-

ing up my improved apparatus with telephone instruments. Fig. 2 is a longitudinal vertical section through the said instrument. Fig. 3 is a cross-section through the same at its central point, and Fig. 4 is a detail longitudinal sectional view through a coil having a slightly-different winding from that shown in Fig. 2.

In operating telephone instruments or other devices for imparting impulses or sending signals over a line of wire I find that by interposing an induction-coil in the line and providing the same with vibrating leaves forming a core I am enabled to reproduce the impulses, sounds, or signals in receiving instruments with greater distinctness and strength than has been hitherto accomplished by other similar systems.

The most important feature of the invention is the coil and core which is interposed in the telephone-line, the coil 1 of which is made up of a primary winding 2 and the secondary winding 3. Suitable end plates 4 4 hold the windings in position, and magnetizing-plates 5 5 are arranged inside the primary winding 2, so as to be located on either side of the core.

The core preferably consists of a series of thin plates or leaves 6 6, which I prefer to make of soft iron. The plates are held in position within the coil by means of a core block or piece 7, which is located between the plates 5 5 at the center of the coil and is provided with apertures to receive the leaves 6. The outer ends of the leaves 6 on each side of the core-block 7 are unsupported and are therefore free to vibrate in response to the energizing or deenergizing of the core 1 and the plates 5 5. Instead of having a single block 7 I may employ a series of small spacing-blocks, as shown in Fig. 3, which hold the leaves at a proper distance from each other. By this construction the free ends of the leaves 6 6 are arranged in such proximity to the ends of the coil that the poles of the said coil can be made to attract the ends of the leaves and draw them more or less out of their normal positions.

In connecting the coil 1 with a telephone-line and its instruments I preferably connect



a transmitter, as 8, with the primary coil 2 and connect a battery 9 or other source of electrical energy with the said primary coil and the said transmitter. The line-wire 10  
5 is connected with the secondary coil 3, which coil is also connected with one or more suitable receivers, as 11. The line-wire may be a grounded one, one end thereof being connected with a ground-plate or other similar  
10 device, as at 12. I find in practice that when my improved instrument is thus connected with a telephone-line and varied impulses are sent through the primary coil 2 by means of the transmitter and battery the leaves or  
15 laminae 6 will be correspondingly vibrated and will incite induced currents in the secondary coil of very high tension and will cause a reproduction of said impulses in a clear strong manner at the receivers.

20 In winding my improved coil the secondary portion thereof may be made of the same thickness throughout, as seen in Fig. 2, or the resistance of the said secondary winding may be reduced opposite the neutral point  
25 of the coil, as clearly illustrated in Fig. 4. In this figure the primary coil 13 is wound as before, while the secondary coil 14 is made of a suitable thickness at each end of the coil, but diminishes toward the center, so  
30 that there is no winding opposite the neutral portion of the coil. This construction while not altering in any way the spirit of the invention contributes to an improvement of the instruments forming the subject of this  
35 application.

The sizes of the wires used in winding the primary and secondary coils may be varied according to the distance over which the line is to be operated. A very good size of wire  
40 for use upon a line of ordinary length is No. 36 for the secondary coil, while a much larger wire—say about No. 24—may be employed in the primary winding. If a line of great length is to be operated, the size of the  
45 wire in the secondary coil should be considerably diminished—say to a No. 50 wire or even smaller, if it can be manufactured. In the use of very small wires it will probably be necessary to insulate them by passing them  
50 through shellac or other similar substance.

The number of the leaves or laminae employed in the core may be varied as desired. A large number of thin plates makes a much more sensitive instrument than a small number  
55 of thicker plates, or even a small number of thin plates. A small number of plates have been shown in the drawings for better illustrating the manner in which they may be drawn out of their natural positions by the  
60 action of the primary coil.

My improved instrument is simple in construction, and yet has proven in use to be exceedingly effective in transmitting all kinds of sound impulses, the slightest of such  
65 sounds being clearly audible at or near the receiving instrument.

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

1. An instrument for increasing the efficiency of apparatus for transmitting electrical impulses, comprising one or more coils having a primary and secondary winding, a core located within the coil and secured therein so as to be free to vibrate at its ends, and  
70 means for connecting the coil with the transmitting-line and instruments, substantially as described.

2. An instrument for increasing the efficiency of telephone-lines, comprising a coil  
80 having a primary and secondary winding, a core mounted in said coil and made up of a series of leaves or plates, means for securing the said plates at their central points within the coil, and means for transmitting electrical impulses to the primary winding for vibrating the said plates or leaves, whereby induced currents of high tension will be imparted to the secondary coil for reproduction upon the line, substantially as described. 90

3. An instrument for increasing the efficiency of telephones comprising a coil having a primary and a secondary portion, magnetizing-plates arranged within the primary portion, a core mounted between said plates  
95 in the said coil, means for securing the plates making up the core at their centers within the coil and spacing them apart, the structure being such that their free ends are in close proximity to the poles of the coil and  
100 may be vibrated by the action of the currents passed through the primary winding thereof, means for connecting the primary winding with a transmitter and a source of electrical energy, and means for connecting  
105 the secondary winding with receiving instruments, whereby augmented impulses will be delivered at the receivers, substantially as described.

4. A transformer for telephones comprising an induction-coil having primary and secondary windings, a laminated core mounted therein, means for spacing the laminae of said core apart and securing them at a point intermediate of their length within the coil,  
110 whereby their ends are left free to vibrate, and means for energizing or deenergizing the primary coil so as to vibrate the plates, whereby the plates will be caused to incite induced currents in the secondary coil of high tension, and reproduce them in receivers at the  
115 ends of the line in a strong and distinct manner, substantially as described.

5. A transformer for telephones comprising an induction-coil having a primary winding of ordinary size, a secondary winding made of the usual size at the ends of the coil but diminished toward the neutral point thereof, whereby the efficiency of the coil is not diminished while its resistance is reduced,  
120 a core mounted within the coil, made up of a series of leaves or plates, means for securing  
125  
130



the plates in position said securing means being arranged opposite the neutral part of the coil, whereby the ends of the plates will be free to vibrate under the influence of impulses passed through the primary winding of the coil, means for connecting transmitting instruments with the primary winding, a battery or other source of electrical energy connected with the said primary coil and the

said transmitters, and means for connecting to the secondary coil with receivers and the line-wire, substantially as described.

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

HANS LIEBREICH.

Witnesses:

JOHN L. FLETCHER,  
CASSELL SEVERANCE.