

No. 683,952.

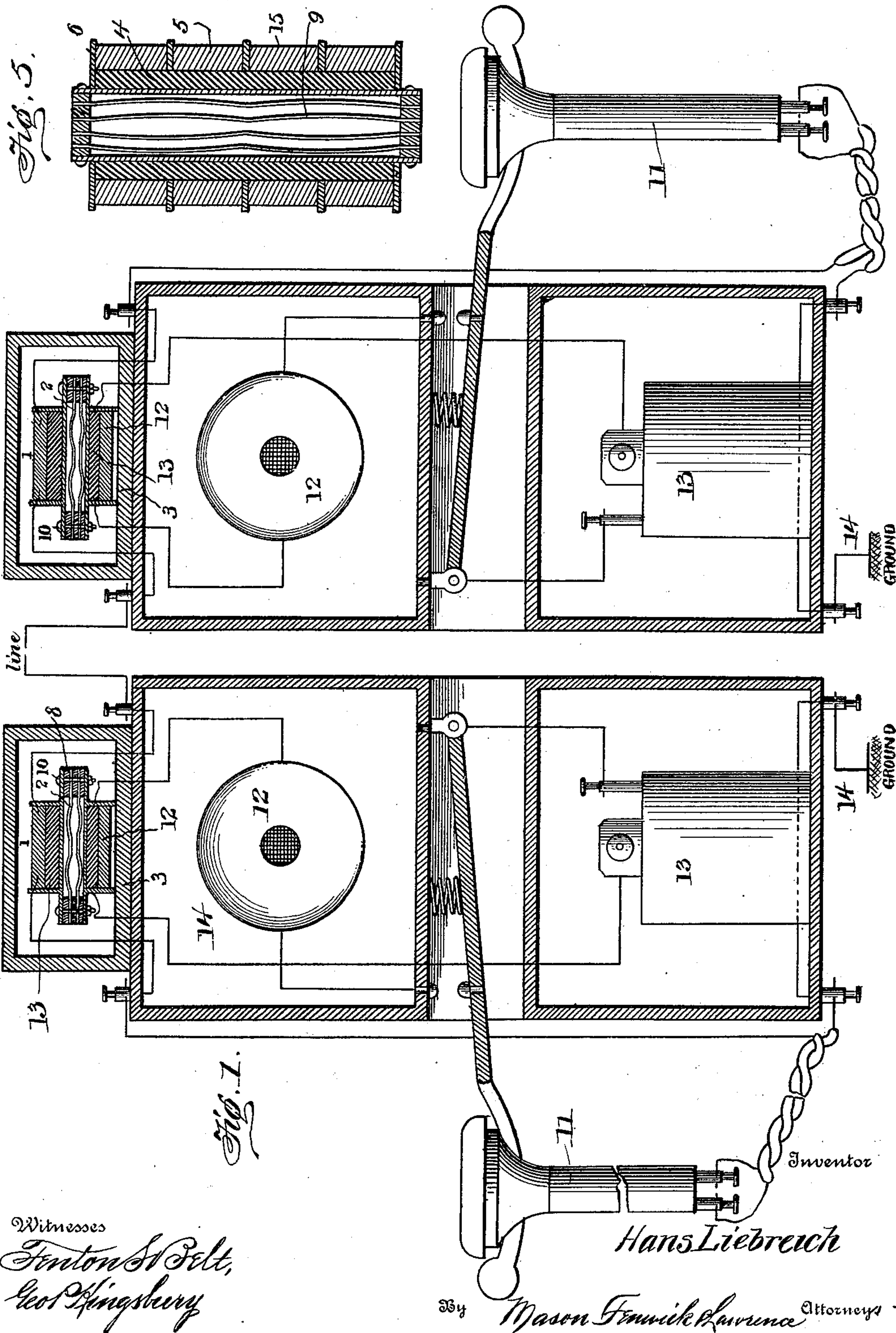
Patented Oct. 8, 1901.

H. LIEBREICH.  
TELEPHONE TRANSFORMER.

(Application filed Nov. 30, 1900.)

(No Model.)

2 Sheets—Sheet 1.





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Fig. 2.

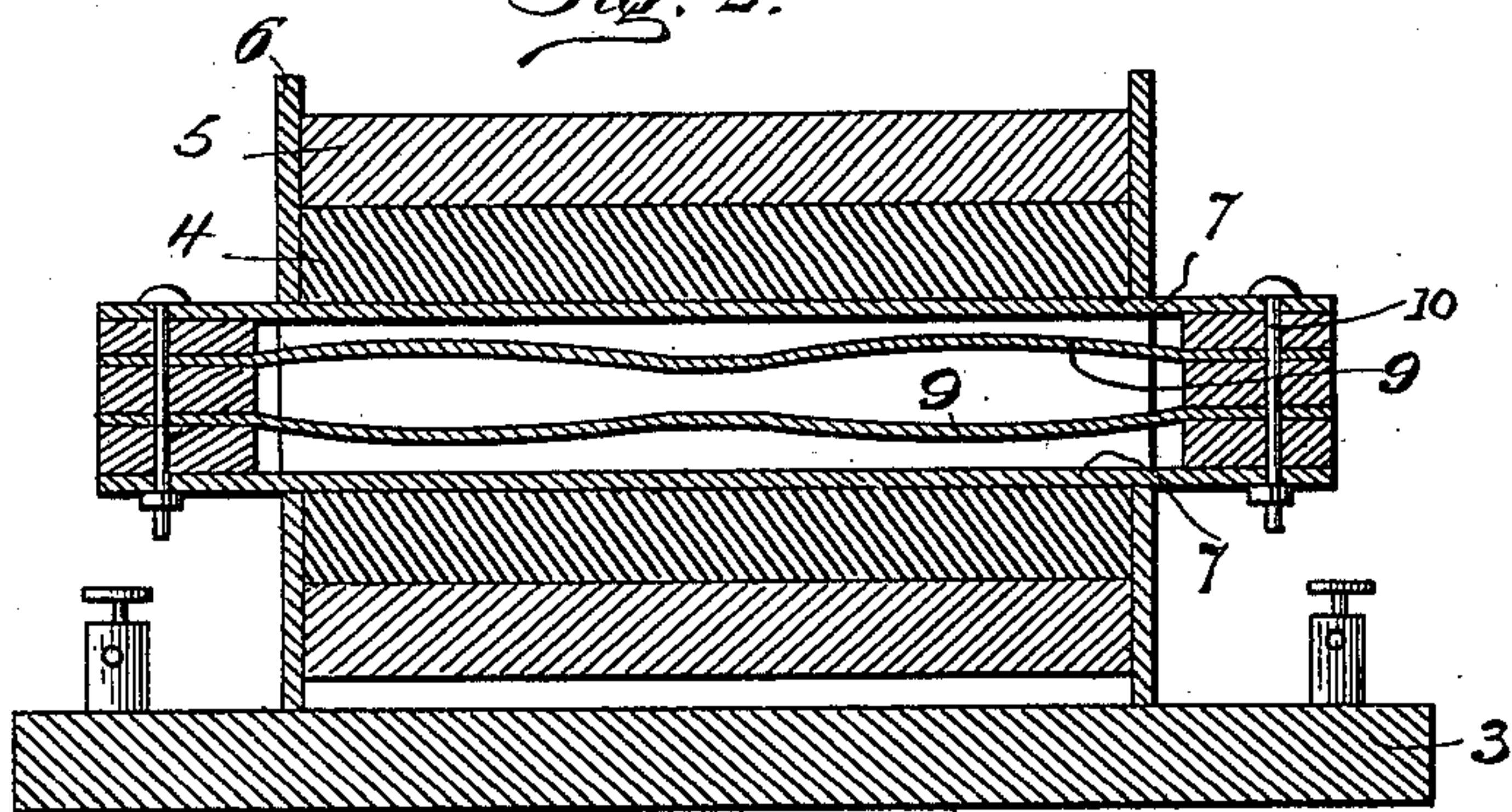


Fig. 3.

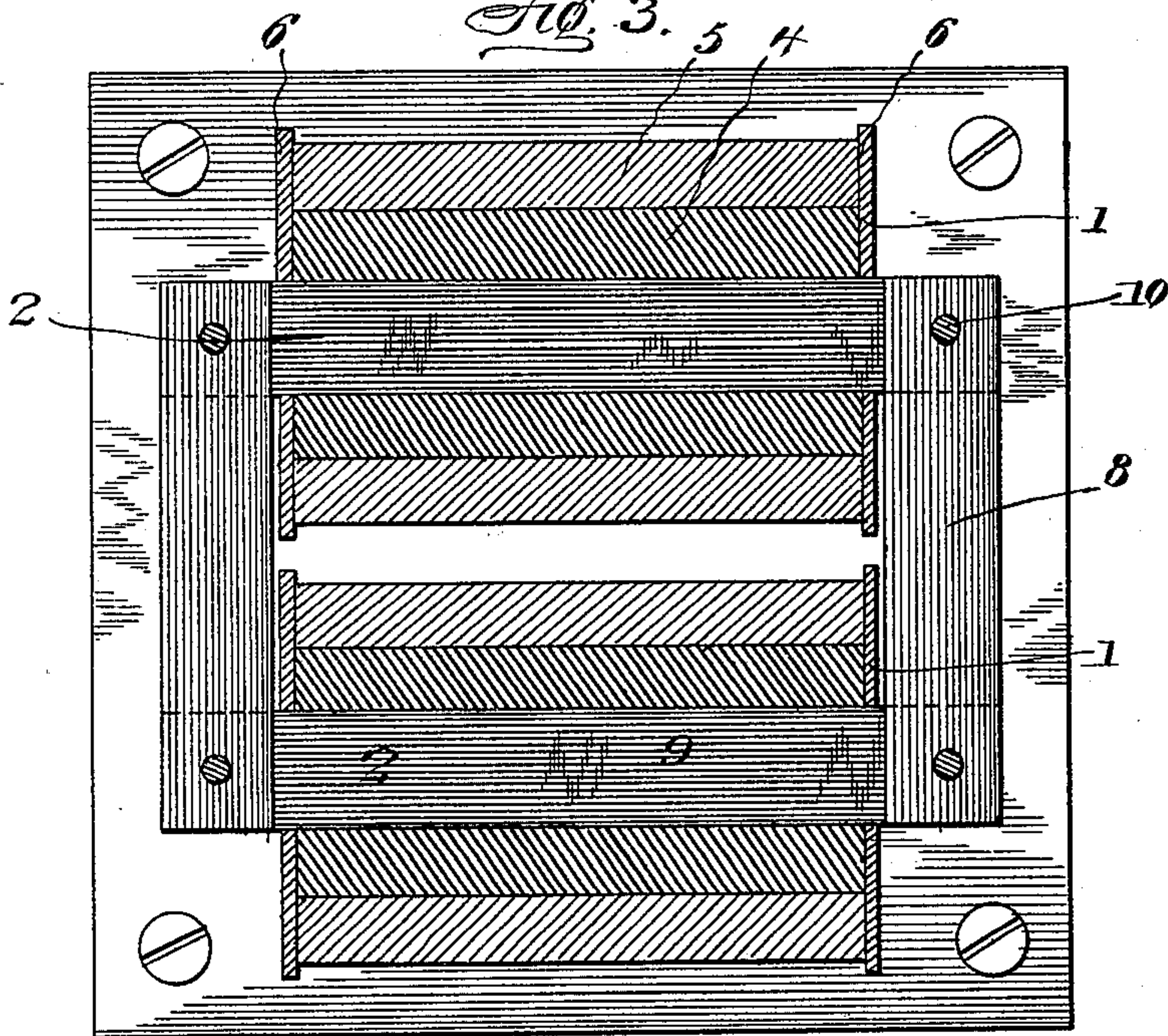
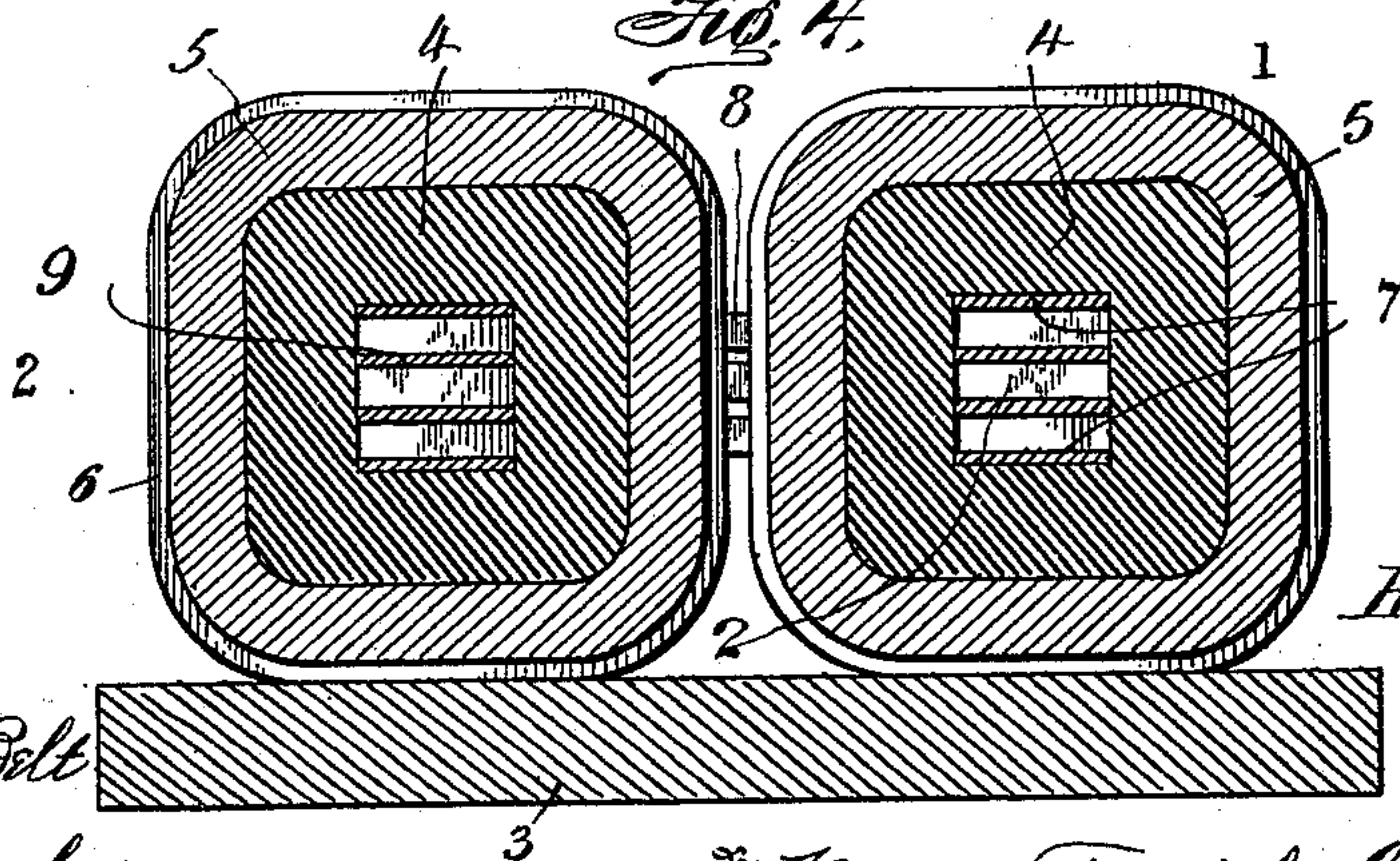


Fig. 4.



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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. 683,952, dated October 8, 1901.

Application filed November 30, 1900. Serial No. 38,193. (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 efficiency with which electrical impulses are transmitted from place to place, and has particular relation to the increasing of the clearness and strength with which tones or impulses are imparted to telephone systems.

It consists in a mechanism for increasing the power of a telephone comprising one or more induction-coils having a core formed of a series of leaves, the said leaves being spaced apart within the coil, so that they may be drawn toward the coil and permit it to vibrate with respect to the same when a current is passed through the primary winding of the said coil, the secondary winding receiving impulses of high tension from the movement of the said plates and transmitting the same to suitable receivers.

It also consists in a transformer for telephone instruments comprising a pair of coils arranged side by side, cores extending through each coil comprising a series of plates free to vibrate within the coils, and armatures connecting the ends of the cores, together with means for passing electrical impulses through the primary windings of the said coils, the movement of the plates thus produced inciting impulses in the secondary coils of high tension.

It further consists in certain other novel constructions, combinations, and arrangements of parts, as will be hereinafter fully described, and specifically pointed out in the claims.

In the accompanying drawings, Figure 1 represents an enlarged diagrammatic view of a telephone apparatus, showing my improved transformer connected up with the transmitters and batteries of the telephone instru-

ments and with the receivers at the ends of the line. Fig. 2 is a vertical longitudinal section through one of the coils, showing the plates of the core located therein. Fig. 3 is a horizontal longitudinal section through a pair of the coils and illustrating the arrangement of the core therein. Fig. 4 is a vertical cross-section through said coils and cores. Fig. 5 is a longitudinal sectional view through a coil having a modified winding.

The present invention is designed to be employed in connection with apparatus for transmitting electrical signals or sounds and is particularly applicable to telephone-lines. When placing the same in practical form, I preferably employ one or more induction-coils having primary and secondary windings and provided with a laminated core, the leaves of which are capable of vibration within the coil.

While I do not limit myself to any number of coils or cores, I have, for the sake of illustration of the present invention, shown a pair of coils 1 1, provided with cores 2 2. The coils are preferably mounted upon a base, as 3, each of said coils having a primary winding, as 4, and a secondary winding, as 5. The primary winding is made of comparatively coarse wire—say about No. 24—which is well insulated and wound in the usual manner, so as to surround the core. The secondary winding 5 is made of wire much smaller in diameter—say about No. 36—which is suitable for ordinary distances. This wire is insulated and wound about the inner cores 4 4.

Suitable end plates of insulating material, as 6 6, hold the windings in place at the ends of the coils. Through the center of the coils I pass a pair of magnetizing-plates 7 7, which are somewhat thicker than the laminated plates forming the core proper. These plates 7 7 may be connected up with the core and with the bars 8 8, which join the ends of the cores. The core proper of each coil is formed of a series of thin flexible plates, as 9 9, which are preferably made of soft iron and are secured at their ends to the connecting-bars 8 8. While I have shown only two of said plates in the drawings, yet I contemplate using in practice a far greater number, since



the efficiency of the instrument and its sensitiveness is much increased by the use of a large number of such plates. A few plates, however, have been shown, so as to better illustrate the manner in which the plates are vibrated and drawn out of their normal position by the action of the primary coils when they are energized. The plates 9 9 are perfectly spaced apart, as shown in Figs. 2 and 4 of the drawings, and this spacing may be admirably accomplished by forming the bars 8 of a series of thin plates, which bridge between the plates 9 9. Where the bars and the plates join each other, I preferably secure them together by means of a bolt or rivet, as 10. By this arrangement the current may be passed from one coil around through the bars 8, through the other coil, and so on. When the primary coil is energized, the opposite ends of the other will be polarized in the usual manner and the plates 9 9 will be drawn near their ends toward the said coils as far as their connection with the bars 8 will permit. The central portions of the plates 9 9 will of course not be moved to any great extent, since they are opposite the neutral portions of the coils.

In practice I find that the movements of the plates 9 9 will produce induced currents in the secondary coils of very high tension, and by connecting the secondary coils with suitable receivers, as 11 11, at the ends of the line the sounds or impulses received through a suitable transmitter will be greatly magnified and reproduced with much greater distinctness than such impulses or sounds are now reproduced in telephones and microphones. In connecting up this instrument with a telephone system I preferably place a set of coils so that it may be connected with a transmitter, as 12, of ordinary construction and may also be connected with a battery, as 13, the battery-transmitter and primary coil being in the same circuit.

In using an instrument of this kind it is not necessary to connect batteries with the line-wires; but the line-wire is connected with the secondary coil or coils and the receivers at the ends of the line are also connected with the said secondary coil or coils. The line may be a grounded one also, as seen in Fig. 1 of the drawings, one of the wires running from the receivers being secured at its end in the ground by means of a ground-plate or other suitable device, as seen at 14 14.

In Fig. 5 of the drawings I have shown a coil which may be wound a little different from those shown in the other views, the difference being in the secondary coil, which, as seen in said Fig. 5, may be wound in a series of sections, as at 15 15, the sections of said winding being separated by means of washers 16, of suitable insulating material. I have illustrated in said Fig. 5 four such distinctly-wound sections, which may be connected with as many different receivers. These four receivers may with this construction be oper-

ated from one transmitter and battery, the primary coil being common to all the sections of the secondary coil and the core being made long enough to incite all the sections of the said secondary coil. It will be apparent, of course, that I may employ a greater number of secondary coil-sections or may only use one or two, as shown in the other figures of the drawings. The action of the instrument in this case is the same as that heretofore described with respect to the other views.

In using instruments of this kind I find that the telephones may be made exceedingly sensitive and that the slightest sounds can be reproduced in a very clear and distinct manner, so as to be clearly heard at some distances from the receivers. The mechanism is simple and not likely to get out of order easily and will prove very effective in increasing the efficiency of the telephone-lines. Such an instrument may be connected up with telephone instruments in common use, as well as being capable of use with new instruments of special construction, when desired.

Having now described my invention, what is claimed as new, and desired to be secured by Letters Patent, is—

1. An apparatus for increasing the efficiency of instruments for transmitting electrical impulses, comprising a coil having a primary and secondary winding, a core mounted therein formed of comparatively thin leaves or plates which are free to be drawn toward the poles of the coils, and means for passing a primary current through the primary winding for vibrating the said plates in conjunction with a transmitting instrument, and means for connecting the secondary coil with a receiving instrument, whereby the highly-induced currents incited in the secondary coil by the vibration of the plates may reproduce the electrical impulses at the receivers with great distinctness and strength, substantially as described.

2. An apparatus for increasing the efficiency of telephones, comprising an induction-coil, a core mounted therein formed of a series of leaves or laminæ which are free to vibrate within the coil, means for holding the plates in position at their ends, and means for connecting the primary coil with a source of electrical power, and an instrument of transmission, and a secondary coil with instruments for receiving the electrical impulses, substantially as described.

3. A transformer for telephones, comprising a pair of induction-coils having primary and secondary windings and cores in each of the said coils made up of vibrating plates properly spaced apart, bars connecting the ends of the said cores and holding them in their spaced positions, and means for connecting the primary coils with a battery and a transmitting instrument, and means for connecting the secondary coils with the line-wire and with receivers at the ends of the line, substantially as described.



4. A transformer for telephones, comprising an induction-coil having primary windings and secondary windings formed of a series of sections insulated from each other, 5 receivers connected with each section, whereby a number may be operated at once, a core formed of plates free to vibrate in said coil, and means for connecting the primary coil with a source of electricity and with a transmitting instrument, substantially as described. 10

5. A transformer for telephones comprising two or more coils mounted upon a suitable base, each of said coils comprising a primary winding of comparatively large wire and a secondary winding of very small wire, 15 insulated plates or disks at the ends of the coils for holding the wires in position, cores extending through each coil and consisting

of a series of thin soft-iron plates, bars connecting the ends of the said cores and consisting of a series of plates adapted to extend between the core-plates for properly spacing them apart, bolts or rivets for securing the connecting-bars to the said plates, and magnetizing-plates arranged within the primary core and upon each side of the core-plates for increasing the magnetic surface of the coils, and means for connecting up the primary coils with the battery and transmitter 20 and the secondary coils with receiving instruments, substantially as described. 25 30

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

HANS LIEBREICH.

Witnesses:

JOHN L. FLETCHER,  
CASSELL SEVERANCE.