

(No Model.)

2 Sheets—Sheet 1.

J. W. McDONOUGH.  
TELEPHONE TRANSMISSION.

No. 446,188.

Patented Feb. 10, 1891.

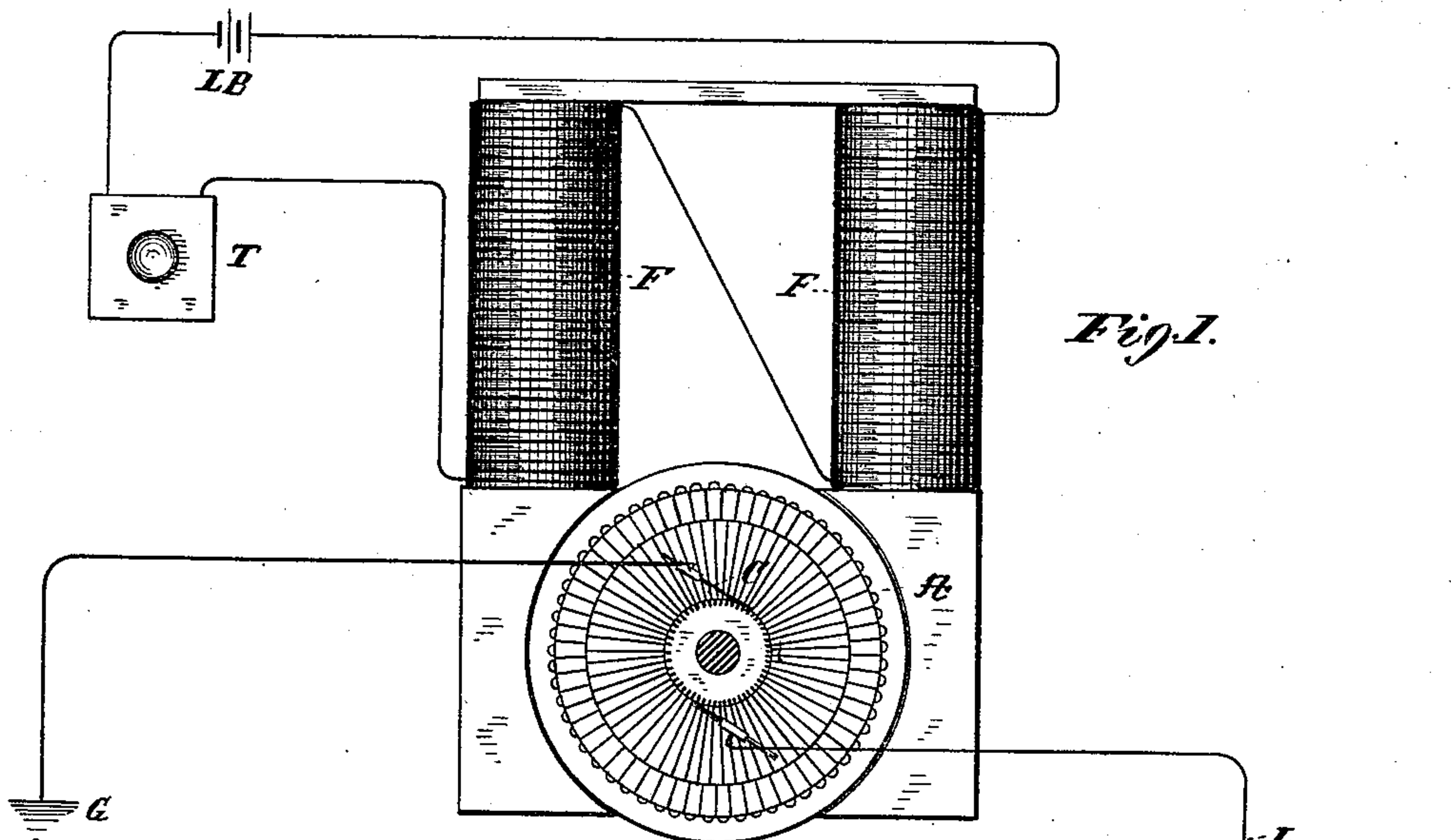


Fig. 1.

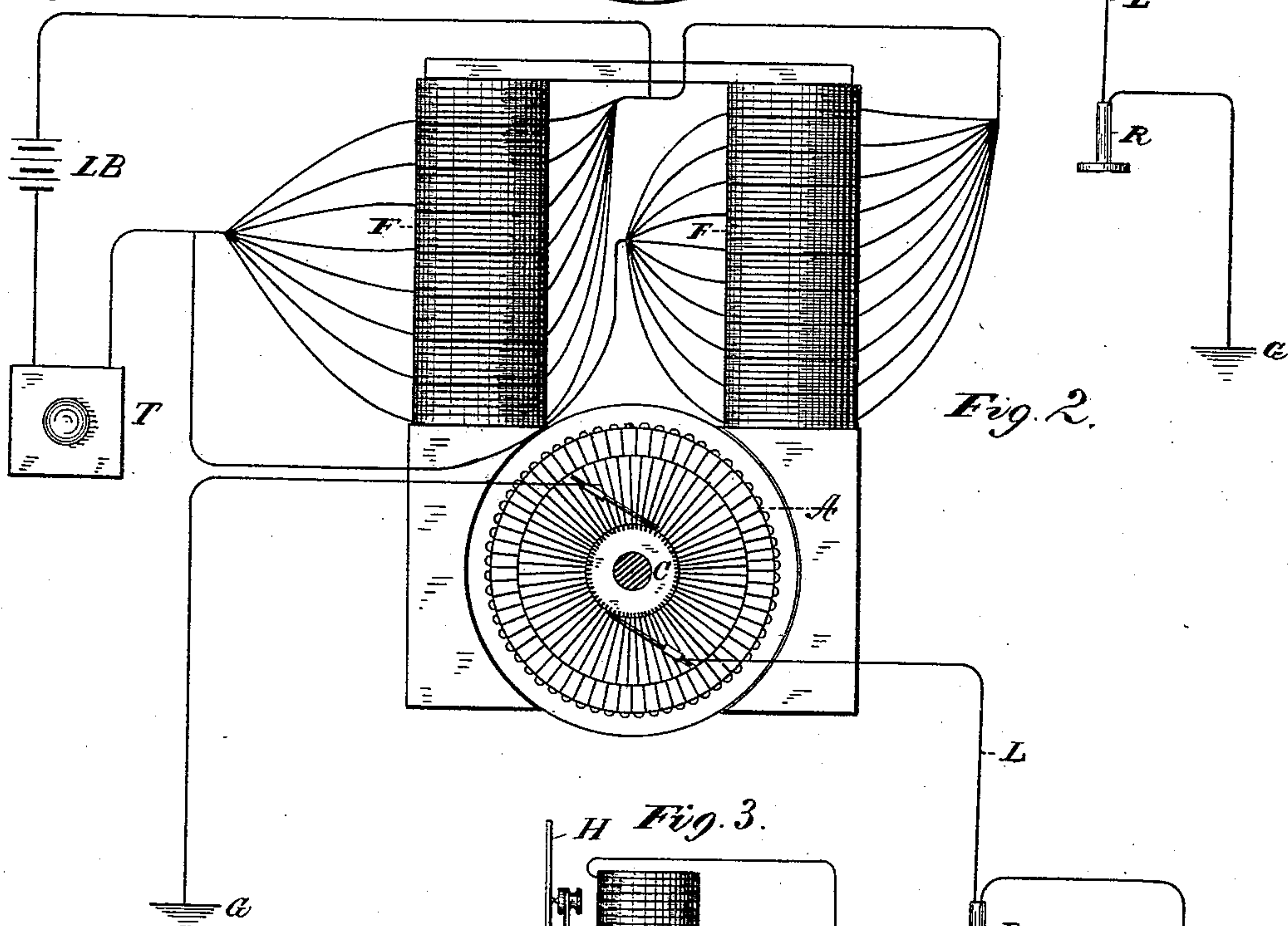
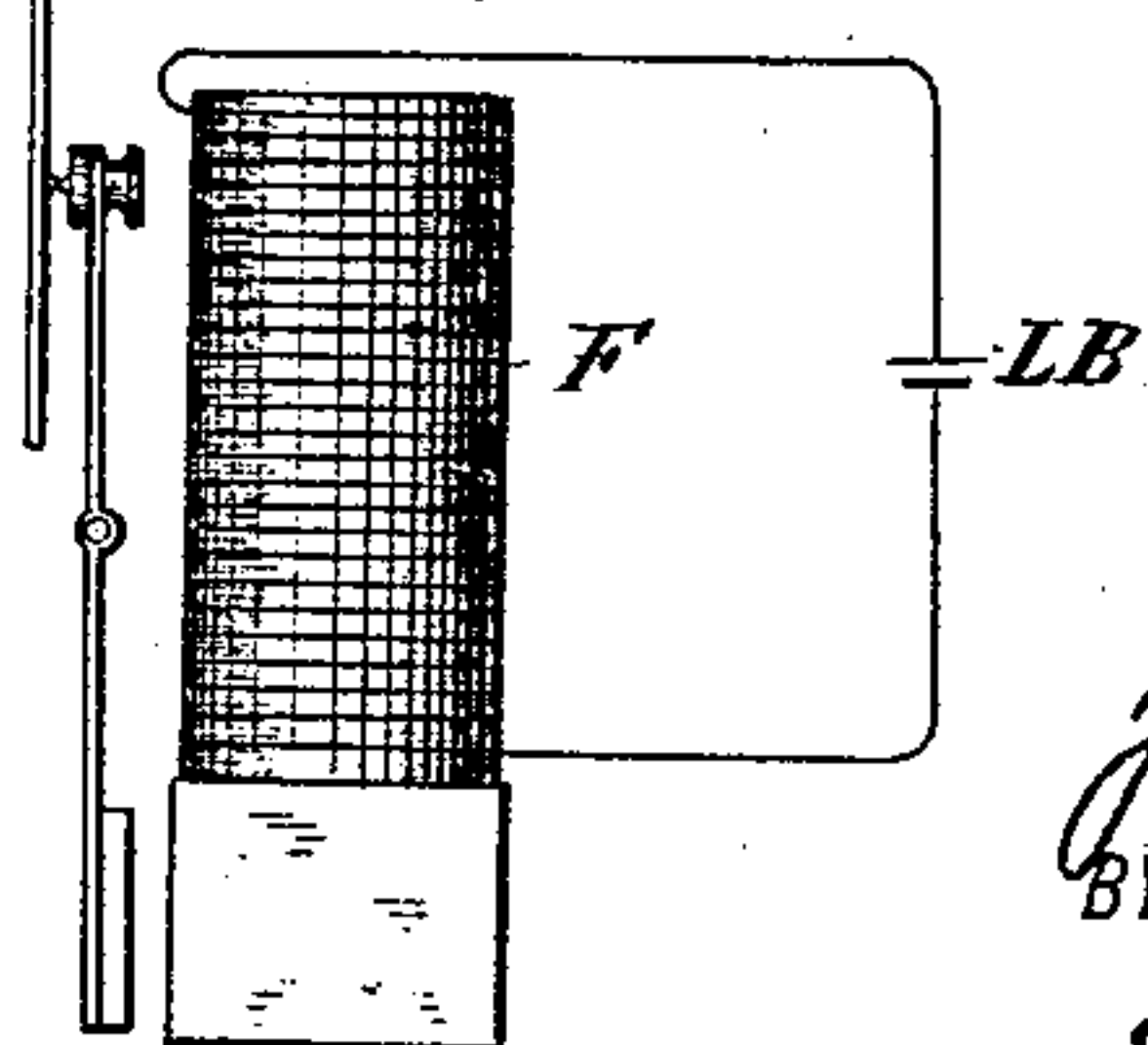


Fig. 2.

Fig. 3.



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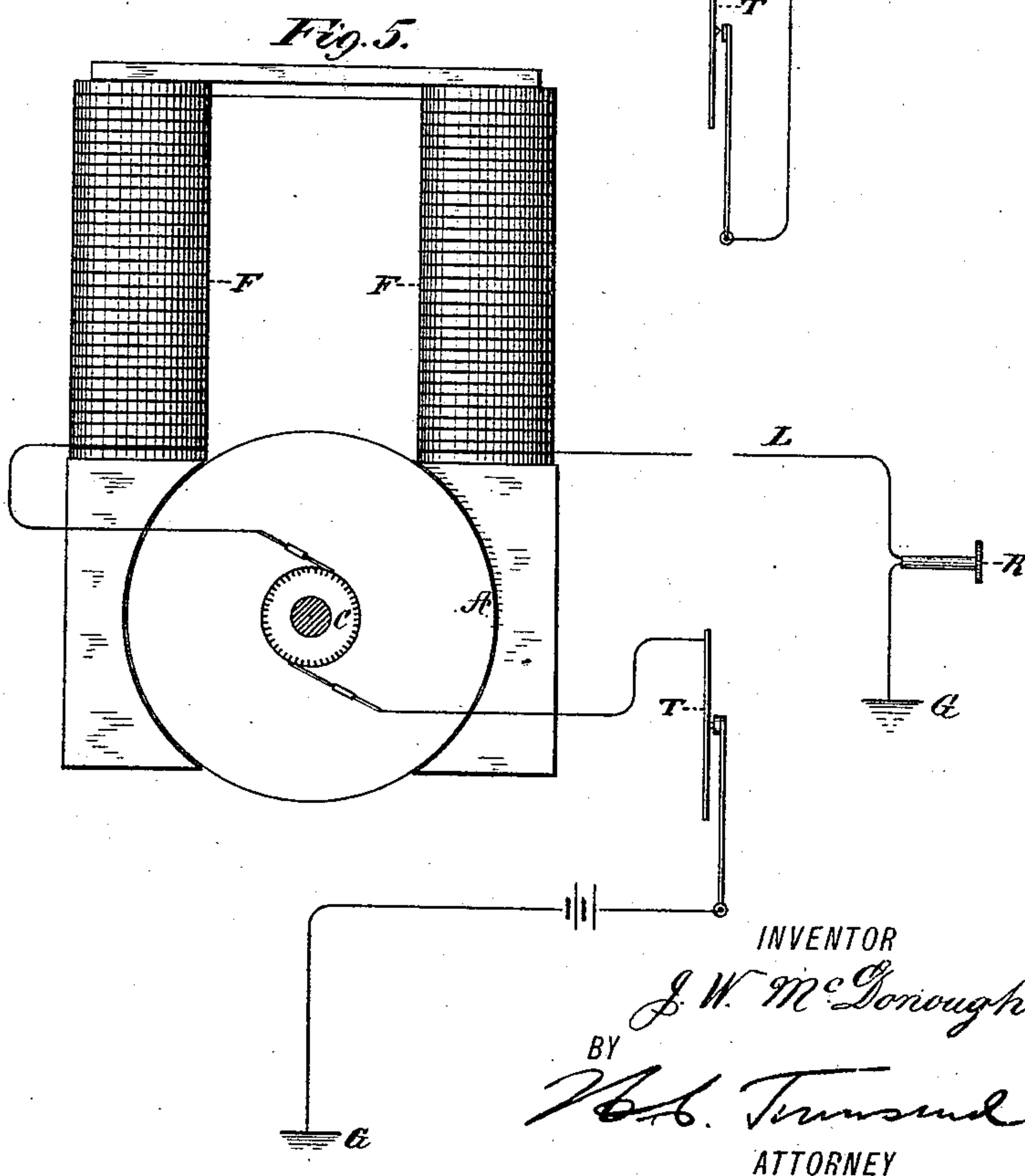
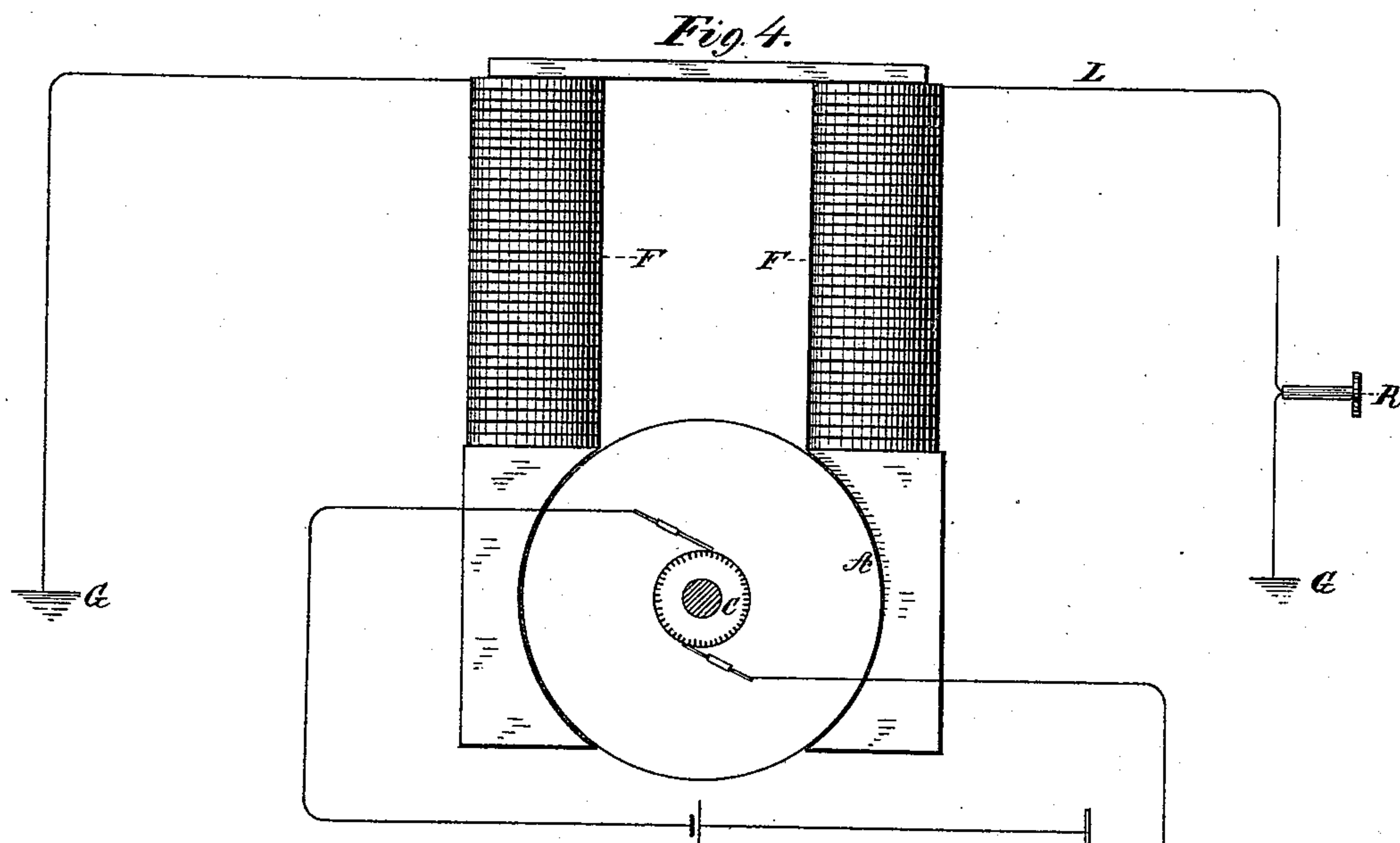
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# UNITED STATES PATENT OFFICE.

JAMES W. McDONOUGH, OF NEW YORK, N. Y.

## TELEPHONE TRANSMISSION.

SPECIFICATION forming part of Letters Patent No. 446,188, dated February 10, 1891.

Application filed August 28, 1885. Serial No. 175,544. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES W. McDONOUGH, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Telephone Transmission, of which the following is a specification.

My invention relates to means for transmitting spoken words and musical tones by the agency of electricity, and is designed as an improvement upon the methods at present in use involving the employment of so-called "induction-coils."

The object of my invention is to increase the volume of sound as transmitted and reproduced; and to this end my invention consists in the combination, with a transmitter responsive to sound-vibrations of any kind, of a dynamo-electric or magneto-electric machine whose field is maintained by an electric current variable through the action of said transmitter, while its armature, operated by any suitable power, delivers a current that is utilized directly or indirectly in operating upon a suitable receiver.

My invention consists, secondly, in a novel method of transmitting sounds electrically by automatically changing the magnetic condition of a dynamo or magneto electric machine in accordance with the sound-vibrations, while at the same time driving the machine by any suitable power, and in employing the changed electric currents thus developed in the machine to operate directly or indirectly upon the receiver.

My invention consists, thirdly, in an improved method of transmitting sounds by electricity, consisting in automatically varying the intensity of a magnetic field through the agency of an instrument responsive to sounds, and in operating the receiving-instrument by means of the current delivered from a magneto-electric armature that is placed in such variable field and is operated by any suitable mechanical power.

In the accompanying drawings I have illustrated preferred forms of apparatus for carrying out my invention.

Figure 1 shows a simple arrangement; Fig. 2, a modified arrangement of the exciting-coils by which the magnetic field is produced.

Figs. 3, 4, and 5 illustrate other ways of carrying out the invention.

Referring to Fig. 1, F F indicates the field-magnets of a dynamo-electric or magneto-electric machine of any desired kind, and A an armature for said machine. I prefer to employ as an armature the well-known Pacinotti or Gramme armature or any other form having quite a large number of coils and adapted to deliver a current of great uniformity.

C indicates the commutator of such armature, and L the conductor leading to the telephone-receiver R at any desired point. The brushes of the commutator are connected to the circuit, so that the armature will deliver a current to the electric circuit connected with the telephone-receiver. The field-magnet coils F are connected in series with one another in or to a circuit containing a battery L B or other generator of electricity, the flow of which through the coils of the field-magnet is controlled in any desired manner by the agency of an instrument responsive to sound-vibrations.

T indicates such an instrument, consisting of an ordinary telephone-transmitter, which, for the purpose of controlling the flow of current in the circuit to the coils, is placed, as shown, in the direct circuit, including said coils and the source of electricity. I do not, however, limit myself to such special arrangement, but design employing any arrangement of connections or of devices whereby, through the agency of an instrument responsive to sound-vibrations, the magnetic intensity of the field in which the armature A revolves may be varied, or vice versa. The armature A is to be driven by any suitable mechanical power and to be kept at as nearly a uniform rate of revolution as is practicable.

The operation of the apparatus described would be as follows: The armature A, being revolved, delivers a current to the circuit L and receiver R, which current being practically continuous produces no sensible or oral sounds in the receiver R. If, however, the magnetic field in which the armature revolves be varied, the current delivered by the armature will, as is well known, be correspondingly varied in accordance with the changes of magnetic intensity in the field. If such



changes be made to take place in accordance with sound-vibrations, pulsations or changes of current in the circuit L and receiver R will obviously correspond to such sound-vibrations and the receiver R will reproduce them. The changes resulting in such action are produced in obvious manner by the action of the transmitter T, which, as it vibrates under the action of sound, produces electrical changes in the current exciting the field magnets for armature A, and if words be spoken to the transmitter T so as to set the same in suitable vibration the words spoken will be produced in the receiver R.

In order that the changes produced by the action of the transmitter may cause as great a change as possible upon the intensity of the field magnetism, it is desirable in case said transmitter operates with variations of resistance to have the coils of the field-magnet oppose little resistance in the circuit. It may therefore be found desirable in some instances to divide the field-coils into sections, as illustrated in Fig. 2, and to connect there in multiple arc, as indicated. The changes in connection obviously would not change the principle or method of operation.

I have shown one way in which the magnetic field may be varied by the action of the sound-vibrations so as to cause corresponding vibrations in the induced armature-current. I do not, however, limit myself to such special means, and might obviously employ other devices for causing the magnetic changes of intensity. One of the ways by which such changes may be produced is by moving an armature with relation to the poles of the field-magnet, so as to vary the sensible magnetic action of the magnet. I have in Fig. 3 indicated a way in which such method might be practiced. D indicates such armature applied to the poles of the field-magnet of the form shown in the preceding figures, and H a diaphragm responsive to sound-vibrations and operating upon the lever carrying the armature, so as to vibrate the armature to and from the poles of the magnet and to produce the changes in the intensity of the magnetic field in which the armature revolves. The field may be maintained by the action of a local battery, whose current circulates in the coils of the field-magnet without practical variations, or the magnet might be simply a permanent magnet. The same variations

may be obtained by placing the transmitter of Fig. 1 in the circuit of the armature and the receiver in that of the field-magnets, as indicated in Fig. 4. The armature and field coils may also be connected in one continuous circuit with the receiver and transmitter, as indicated in Fig. 5. In both these instances the changes of magnetic condition produced in the machine by the action of the transmitter while the machine is being run by any suitable power will result in developing correspondingly-changing currents by the action of the driving-power, and the strong currents thus produced are singly or in conjunction with the original circuits made to operate the receiver.

What I claim as my invention is—

1. The herein-described method of transmitting sounds electrically, consisting in producing changes in the intensity of a magnetic field corresponding to the character of the sound-vibrations, revolving a magneto-electric armature in said field by any suitable power, and delivering the variable currents as produced to a suitable receiving-instrument.

2. The herein-described method of transmitting sound electrically, consisting in producing changes in the intensity of an electric armature revolving in a magnetic field by any suitable power in correspondence with the changes in the intensity of the vibrations of the sound to be transmitted, and delivering the variable currents thus produced to a suitable receiving-instrument.

3. The herein-described method of transmitting sound electrically, consisting in automatically changing the magnetic condition of a dynamo or magneto electric machine in accordance with the changes of intensity of the sound waves or vibrations to be transmitted, while at the same time driving the machine by any suitable external power, and delivering the electric vibrations thus produced in a circuit of the machine directly or indirectly to a suitable receiver.

Signed at Geneva Lake, in the county of Walworth and State of Wisconsin, this 15th day of August, A. D 1885.

JAMES W. McDONOUGH.

Witnesses:

FRANK L. EASTMAN,  
C. E. BUELL.