

No. 836,015.

PATENTED NOV. 13, 1906.

L. DE FOREST.

AEROPHONE.

APPLICATION FILED DEC. 11, 1905.

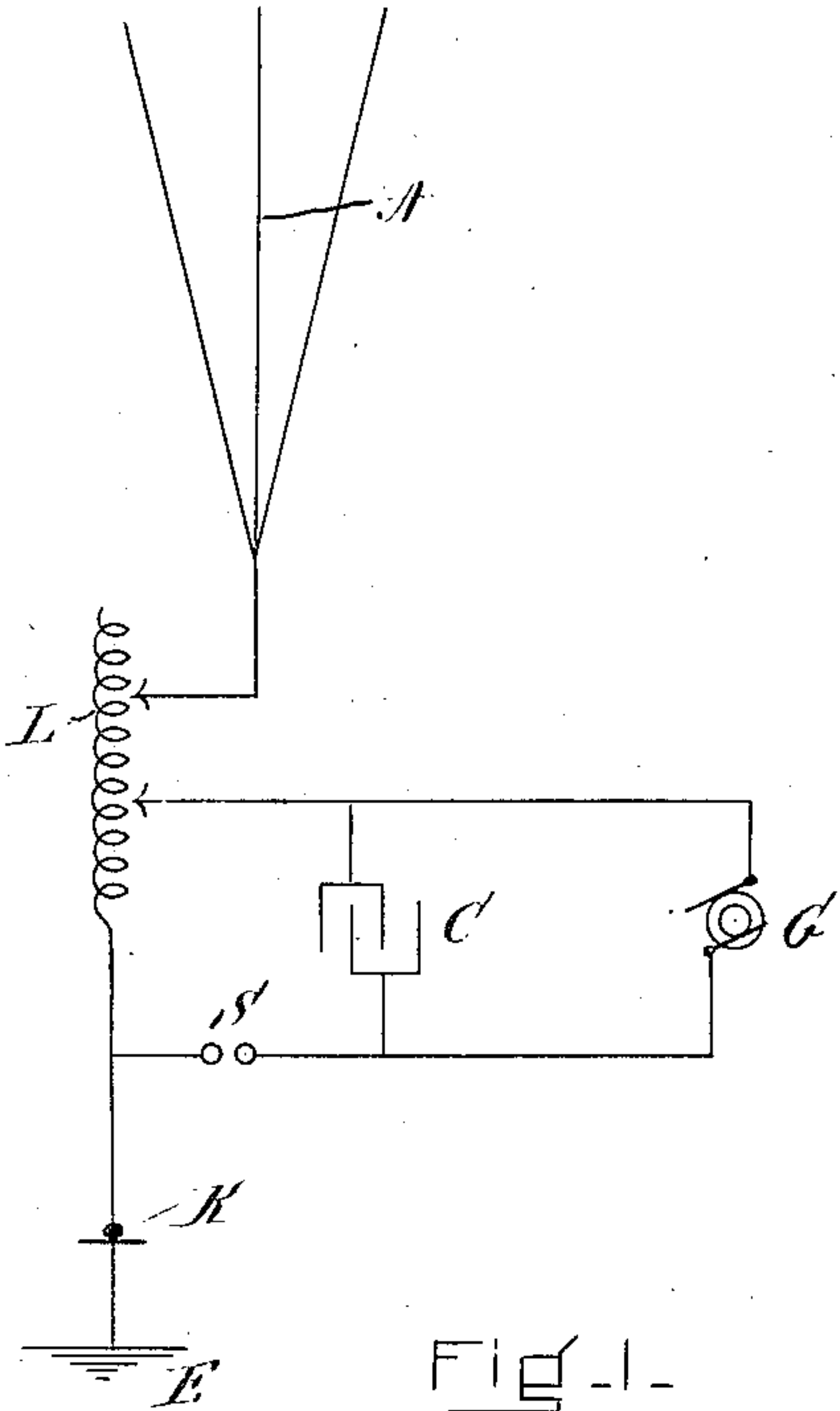


Fig. 1.

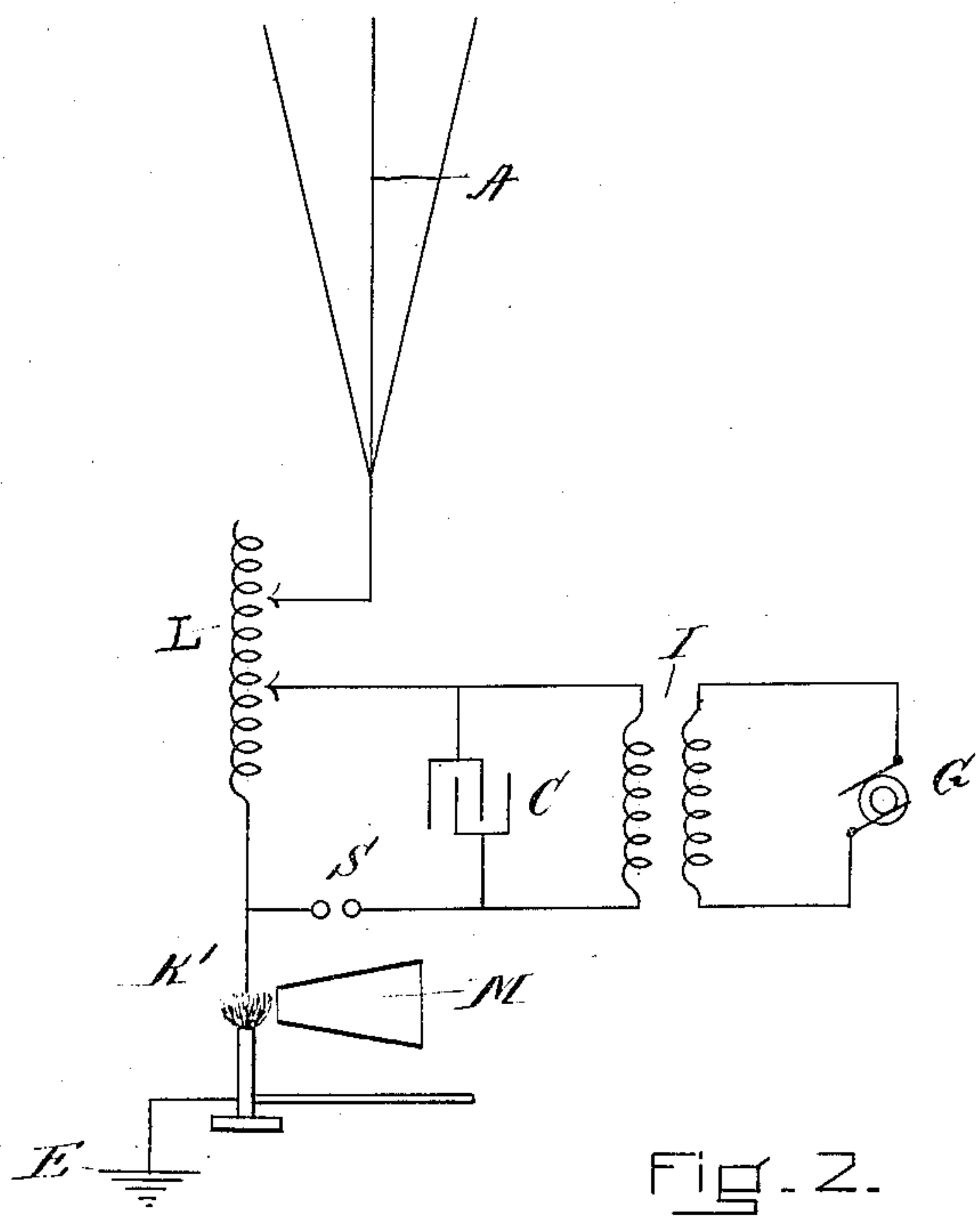


Fig. 2.

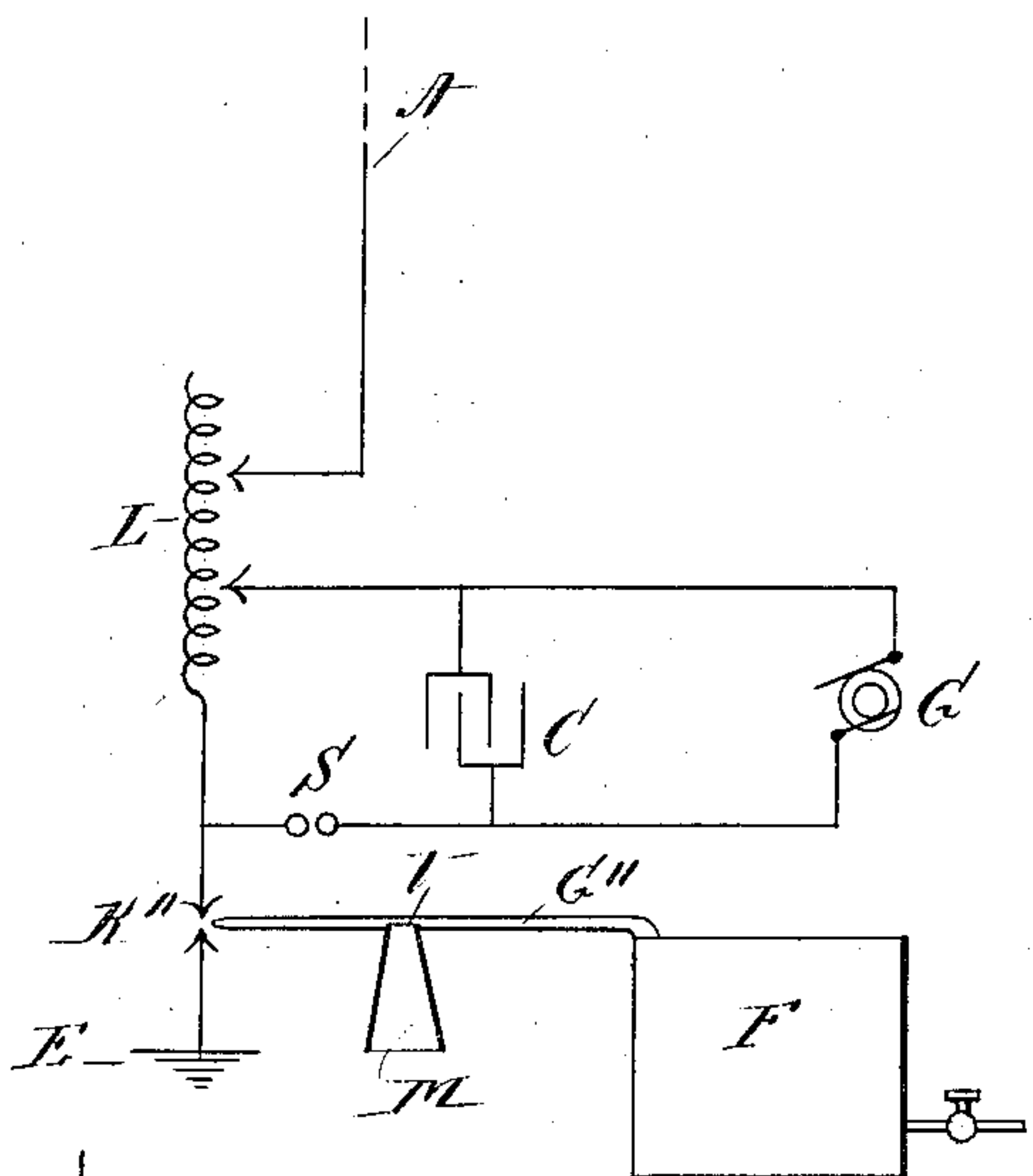


Fig. 3.

WITNESSES:
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UNITED STATES PATENT OFFICE.

LEE DE FOREST, OF NEW YORK, N. Y.

AEROPHONE.

No. 836,015.

Specification of Letters Patent.

Patented Nov. 13, 1906.

Application filed December 11, 1905. Serial No. 291,222.

To all whom it may concern:

Be it known that I, LEE DE FOREST, 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 a new and useful Improvement in Aerophones, of which the following is a specification.

My invention relates to wireless-telephone systems for transmitting and receiving vocal or other sounds, including articulate speech, by electromagnetic waves.

The object of my invention is to produce a wireless telephone or aerophone in which a resistance device is varied by and in accordance with the air-vibrations accompanying vocal or other sounds, and thereby correspondingly varies the amplitude of continuously-transmitted trains of electromagnetic waves and in which said waves, so varied as to amplitude, develop in a receiving system electrical oscillations correspondingly varied, and thereby correspondingly vary the amplitude of the current in a telephone-receiver.

My invention may best be understood by having reference to the drawings which accompany and form a part of this specification and which illustrate conventionally several devices and systems of circuits whereby my invention may be carried into effect.

In the drawings, Figures 1, 2, and 3 are diagrams of aerophone transmitting systems.

In Figs. 1, 2, and 3, G is a high-frequency alternating-current generator producing at least seven hundred and fifty cycles per second and preferably the frequency of said generator should be as high as can conveniently and commercially be produced.

In Figs. 1 and 3 the generator G energizes the oscillating circuit C S L directly, although, as shown in Fig. 2, the transformer I may be interposed between said circuit and generator for appropriately varying the difference of potential impressed upon the condenser C by the generator. By means of the adjustable connections of the oscillating circuit and antenna A with the inductance L the natural periods of said antenna and circuit may be brought into agreement.

The element shown in the several figures as K K' K'' represents a resistance device of any suitable character which is adapted to be controlled by the vibrations of the air accompanying vocal or other sounds, including articulate speech.

In Fig. 1, K is represented as a carbon mi-

crophone, preferably of the kind used in circuits carrying currents of amplitudes large compared to the amplitudes of the currents which are modified by the usual granular carbon transmitter in ordinary wire telephony. In Fig. 2, K' is a flame made more conducting by the addition of sodium salts or other suitable salts. In Fig. 3, K'' is a spark-gap.

The variable-resistance devices may best be placed, as shown in Figs. 1, 2, and 3, at points in the system near the earth connection, because at such points the current in the system is near its maximum value and the potential is near its minimum value. Accordingly, the said resistance devices are less liable to be injured or rendered inoperative by having excessive potentials impressed upon their terminals and are enabled to produce a far greater variation in the amplitude of the currents in the antenna, and hence in the amplitude of the radiated waves by slight changes in resistance, than if they were located between the inductance L and the top of the antenna. In other words, I do not limit myself to any particular type of variable-resistance transmitter, but consider any suitable transmitter operatively associated with the system as set forth in the claims within the scope of my invention when used to vary the amplitude of electrical oscillations produced by a continuously-operating train of sparks having a spark-gap frequency higher than the frequency of the more essential vibrations accompanying speech—as, for example, fifteen hundred pulsations per second.

With all the variable-resistance devices K any suitable sound amplifying and concentrating device may be used—such, for example, as the megaphone M (shown in Figs. 2 and 3) or the well-known compressed-air device F, (shown in Fig. 3,) in which the diaphragm V of the megaphone operates on a reducing-valve to vary the flow of air from the tank F through the nozzle G''.

The operation is as follows: In Figs. 1, 2, and 3 the generators G charge the condensers C a sufficient number of times per second to create in the oscillating circuits S C L electrical oscillations having a spark frequency higher than the more essential frequencies which make up the complex voice-waves, and said oscillations result in the radiation from the antenna of electromagnetic waves having similar spark frequency. The electromagnetic waves develop oscillations in a re-

ceiving-antenna, thereby producing a current varying at a rate equal to the spark frequency of the transmitted waves. The effect of said varying current on the telephone-receiver depends, of course, upon the rate of its variation. If desired, this rate may be made to exceed the limit of response of the telephone-diaphragm; but such rapid variation is not necessary, all that is necessary being, as in the case of the well-known Gibboney or Hutin-Leblanc alternating-current systems of telephony, that the rate of current variation in telephone-circuit be higher than the most important frequencies occurring in telephonic transmission, in which case the telephone will produce a note having the pitch equal to the spark frequency employed at the transmitting-station. In either case any variation in the amplitude of the currents in the local telephone-circuit will produce a corresponding variation in the sound emitted by the telephone, and therefore if by any of the variable-resistance transmitters shown herein or by any other means the amplitude of the transmitted waves be modified in a manner corresponding to the voice-waves the telephone will reproduce sounds simulating those produced at the transmitting-station.

30 An apparatus whereby the method herein-after claimed may be realized is claimed in a divisional application, Serial No. 292,922, filed December 22, 1905.

My invention is broader than mere apparatus, and accordingly it will be obvious that many other devices and systems may be devised for varying by and in accordance with speech-waves the amplitude of continuously transmitted trains of waves having a spark-gap frequency higher than the more essential frequencies accompanying speech, and therefore I do not wish to limit my invention to the particular embodiments thereof herein shown and described.

I claim—

1. The method of transmitting speech by electromagnetic ether-waves, which consists in developing in an antenna electrical oscillations having a spark frequency higher than the more essential frequencies accompanying speech, modifying said oscillations between the point at which energy is supplied to the antenna and the earth connection thereof by and in accordance with speech-waves, and converting the modified oscillations into electroradiant energy.

2. The method of transmitting vocal or other sounds by electromagnetic ether-waves which consists in developing in an antenna electrical oscillations having a spark frequency higher than the more essential frequencies accompanying the sounds to be transmitted, modifying said oscillations at a point below that at which the energy is supplied to the antenna in accordance with said sounds and converting the oscillations so modified into electroradiant energy.

3. The method of transmitting speech by electromagnetic ether-waves which consists in developing electrical oscillations having a spark frequency higher than the more essential frequencies accompanying speech, translating the energy of said oscillations to a transmitting-antenna, modifying the oscillations in said antenna at a point below that at which the energy is supplied to the antenna in accordance with the vibrations of the air accompanying speech and converting the modified oscillations into electroradiant energy.

In testimony whereof I have hereunto subscribed my name this 7th day of December, 1905.

LEE DE FOREST.

Witnesses:

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PHILIP FARNSWORTH.