L. DE FOREST.

OSCILLATION GENERATOR.

APPLICATION FILED DEC. 28, 1915.

1,201,273. Patented Oct. 17, 1916.

Fig. 1.

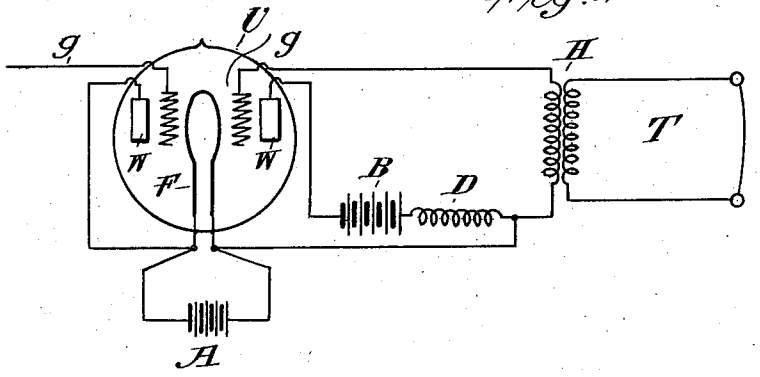
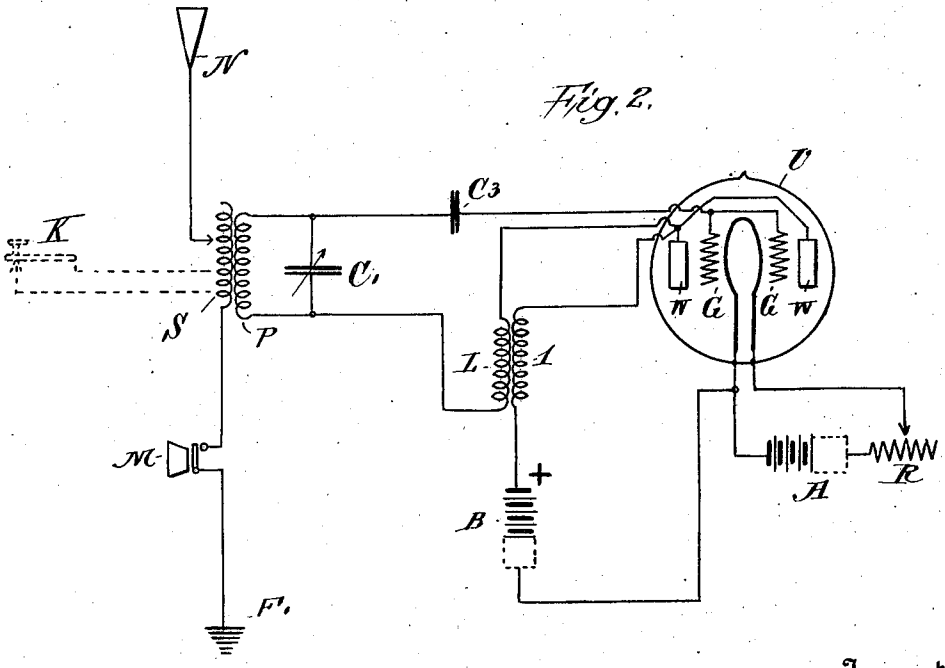


Fig. 2.



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UNITED STATES PATENT OFFICE.

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OSCILLATION-GENERATOR.

1,201,273. Specification of Letters Patent. Patented Oct. 17, 1916.

Original application filed May 13, 1915, Serial No. 27,771. Divided and this application filed December 28, 1915. Serial No. 68,987.

To all whom it may concern:

Be it known that I, LEE DE FOREST, a citizen of the United States, residing at New York city, county of Bronx, State of New York, have made a certain new and useful Invention in Oscillation-Generators, of which the following is a specification.

This invention relates to generators of oscillating, or pulsating currents and embodies subject matter divided from my application Serial No. 27,771, filed May 13, 1915.

The object of the invention is to provide a generator of oscillating, alternating or pulsating electric currents which is simple and efficient.

A further object is to provide an oscillation generator of the character referred to capable of generating oscillating, alternating or pulsating electric currents of substantially uniform amplitude.

Other objects of the invention will appear more fully hereinafter.

The invention consists substantially in the construction, combination, location and relative arrangement of parts, all as will be more fully hereinafter set forth, as shown in the accompanying drawing and finally pointed out in the appended claims.

Referring to the drawing: Figure 1 is a circuit diagram showing an arrangement of generator of continuous, oscillating, alternating or pulsating currents embodying my invention. Fig. 2 is a similar view showing a modified arrangement of oscillating generator embodying my invention as applied for use in connection with radio systems.

In carrying out my invention I employ a closed and preferably, evacuated vessel or bulb in which are located cold and hot electrodes, and I provide suitable circuit connections and current supply source to said electrodes, and where the generator is employed in connection with radio systems I associate the generator with a suitable radiating system having means connected thereto or associated therewith for altering or modifying the radiations from the system either manually, as through a telegraph key, or otherwise, as for instance, a telephone transmitter, in accordance with signal code or sound waves.

Referring to Fig. 1, U designates the evacuated vessel or bulb. Located within this vessel or bulb is a hot electrode F, which, in the form shown, is a filament and also located within the evacuated vessel U are the cold electrodes *g* and W. To the filament or glower electrode F current is supplied from any convenient source as indicated at A, which source may be a battery or a direct current generator. Where an alternating current generator is employed the frequency thereof for wireless telephone operation, should be above that of the essential frequencies of voice sounds, say for instance, fifteen hundred cycles per second, or higher. For wireless telegraph work the frequency of the generator may be very much lower, say, for example, five hundred cycles per second.

In the particular form shown but to which my invention is not to be limited or restricted, I employ two cold electrodes W in the form of plates or wings, and one cold electrode *g* in the form of a grid and I have shown the grid electrode *g* positioned between the hot electrode F and one of the cold plate or wing elements W. A circuit has one of its terminals connected to the cold grid electrode W. This connection including a source of current B to an inductance coil D. This circuit connection of electrodes *g* and W is also connected to one side or terminal of hot electrode F. The other cold plate or wing electrode W is shown connected to the other side or terminal of the hot electrode F. If desired, the circuit connection between the cold electrodes *g* and W may be suitably associated with a telephone indicated at T. This association may be accomplished through a transformer H or other suitable form of coupling.

Referring to Fig. 2, I have shown the

evacuated vessel or bulb U having two cold plate or wing electrodes A, in electrical connection with each other and two cold grid electrodes G in electrical connection with each other. The two cold plate or wing electrodes having a circuit connection to one side or terminal of the hot electrode F, which circuit connection includes an inductance coil *l*, and a source of current supply indicated at B, the positive side of which is connected to the cold plate or wing electrodes W and the negative side to one terminal of the hot electrode F. In this instance the circuit connection between the cold grid electrodes G, and the cold plate or wing electrodes W, includes a blocking condenser, indicated at C_2. Connected across this circuit is a variable capacity C_1, and included in said circuit is an inductance coil P, which constitutes, in the form shown, a coupling member in association with a coil S, in the antenna earth system N, E, the coupling being preferably a loose coupling. Where the apparatus is to be used for telephoning purposes the antenna has associated therewith or includes therein a microphone transmitter M. Where the apparatus is to be used for telegraphic communication a Morse telegraph key K is bridged across a portion of the inductance S. If desired the grid and plate circuit may be inductively associated with the plate and filament circuit through inductance L, as shown. It is obvious that the current supply to the hot electrode F, or to the circuit connection of cold plate or wing electrodes W, may be controlled in any suitable or convenient manner, as, for instance, by the adjustable resistance R.

By reason of the arrangements above described and the ionizing of the gas in the evacuated vessel or bulb U due to the presence within said vessel of the hot or glower electrode F, and by impressing an electromotive force within the space between the cold plate or wing electrodes W and the hot electrode from the current source B, the device U, with its electrodes and their associated circuits and circuit connections as described becomes a generator of oscillating, alternating or pulsating electric currents which are impressed upon the circuit which connects the grid and plate electrodes, the frequency of which depends upon the condition of the gas within the vessel U, the spatial relation of the electrode member contained therein, the value of the electro-motive force impressed across the electrodes, and the amount of inductance and capacity in or associated with the circuit connection between the cold electrodes. This frequency may be varied by adjusting the capacity or inductance in said circuit connection.

By reason of the association of the oscillating circuit connecting the cold electrodes with the antenna earth system N E the oscillating, alternating or pulsating currents in said circuit connection are impressed upon said antenna earth system, and with a natural period of oscillation in said circuit, the same as that in said oscillating circuit. The emission of wave trains from the antenna earth system may be controlled in accordance with the telegraphic code through the telegraph key K which acts to short circuit a portion of the inductance S. Or, if desired, the amplitude of the oscillations induced in the antenna earth system may be varied by and in accordance with sound waves falling upon the microphone transmitter M in the usual manner. It is obvious that the wave length of the emitted wave trains may be altered in a manner well understood in the art.

I am unable at the present time to give a wholly satisfactory explanation of the theory of the generator action of the apparatus. I have discovered, however, as hereinbefore stated that a system constructed as shown and described and energized from a suitable current source becomes the seat of continuous oscillations and it is my opinion that the phenomenon depends upon the inductive effect of successively applied charges or surges of potential upon the grid and plate electrodes which charges or surges have the power to affect momentarily the conductivity of the surrounding or inter-connecting gas medium within the vessel in such manner that the action, when set up, is self perpetuating.

From the foregoing description it will be observed that in its broad scope my invention lies in the discovery that when suitably connected and associated an audion becomes a generator of oscillating, alternating, or pulsating electric currents which may be utilized for any purpose for which such currents are desired, and I have succeeded in securing remarkable results in the practical use and operation of an oscillation generator of this character particularly when applied to the generator of high frequency oscillations.

It is obvious that the principles of my invention may be embodied in various arrangements and circuit connections without departure from the spirit and scope of my invention as defined in the claims, but

Having now set forth the objects and nature of my invention and circuit arrangements embodying the principles thereof, what I claim as new and useful and of my own invention, and desire to secure by Letters Patent, is—

1. The combination with an evacuated vessel, of a plurality of wing elements, a

plurality of grid elements, and a hot electrode arranged therein, a grid element being arranged between each wing element and the hot electrode.

2. An audion having a plurality of grid electrodes, a plurality of wing electrodes, and a hot electrode.

3. An audion having a plurality of grid electrodes, a plurality of wing electrodes, and a hot electrode, a grid electrode being interposed between each wing electrode and the hot electrode.

In testimony whereof I have hereunto set my hand in the presence of the subscribing witnesses, on this 21st day of December, A. D., 1915.

LEE DE FOREST.