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APPARATUS FOR THE PRODUCTION OF INTERMITTENT OR CONTINUOUS HIGH FREQUENCY OSCILLATIONS

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1,372,808. Patented Mar. 29, 1921.

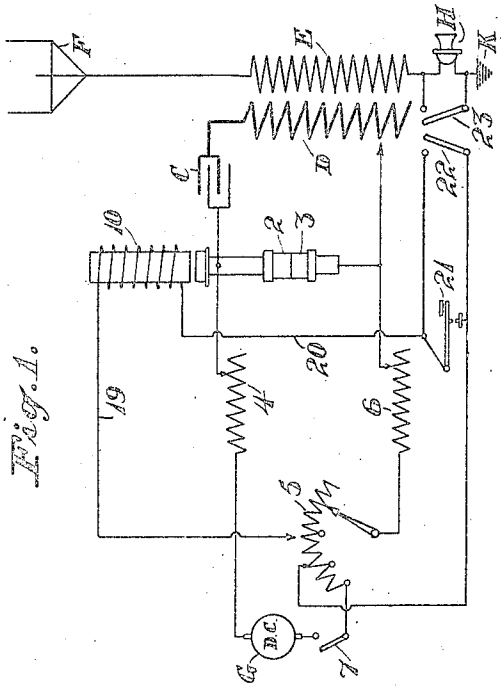


Fig. 1.

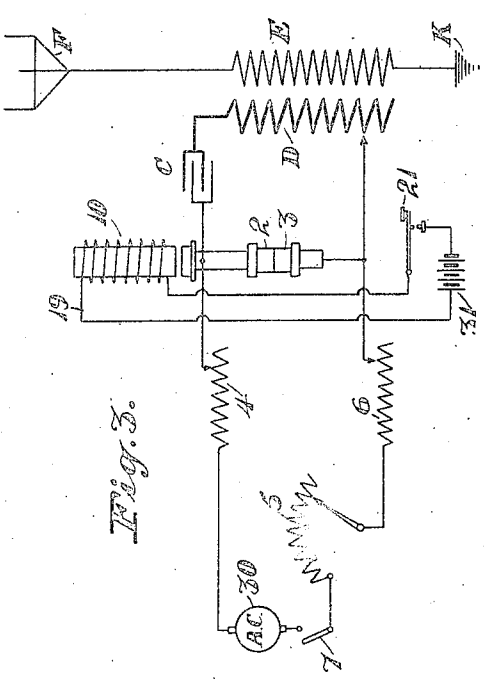


Fig. 3.

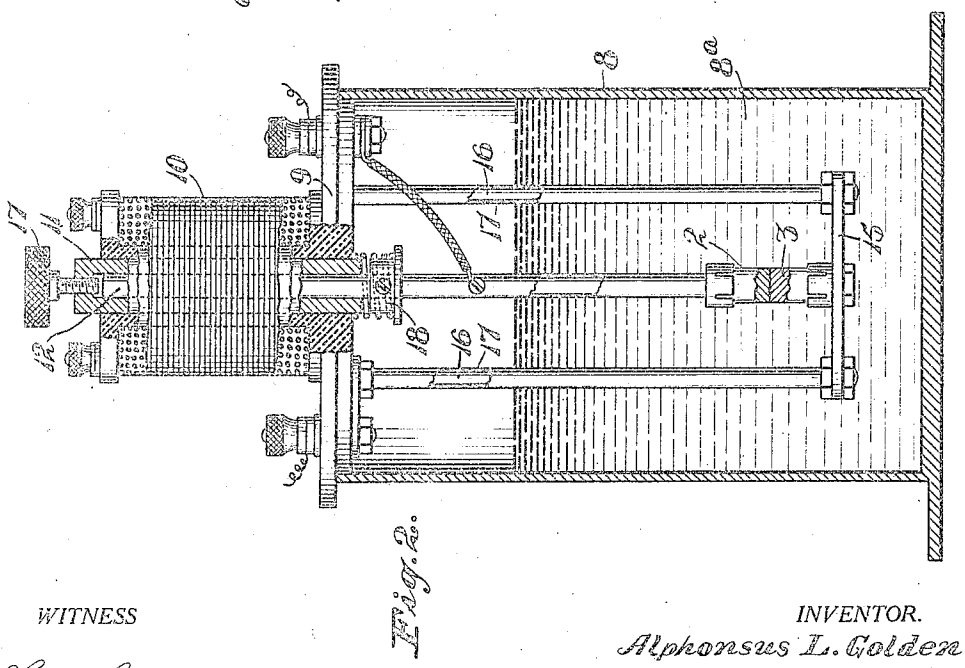


Fig. 2.

WITNESS

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APPARATUS FOR THE PRODUCTION OF INTERMITTENT OR CONTINUOUS HIGH-FREQUENCY OSCILLATIONS.

1,372,808. Specification of Letters Patent. Patented Mar. 29, 1921.

Application filed April 1, 1918. Serial No. 226,083.

To all whom it may concern:

Be it known that I, ALPHONSUS L. GOLDEN, a citizen of the United States, residing at Oakland, in the county of Alameda and State of California, have invented new and useful Improvements in Apparatus for the Production of Intermittent or Continuous High-Frequency Oscillations, of which the following is a specification.

This invention relates to an oscillator of the submerged type, which is particularly adapted for the production of intermittent or continuous high frequency oscillations.

One of the objects of the present invention is to provide an oscillator for the production and radiation of electromagnetic waves which may be used either for radio-telegraph or for radio-telephone communication. Another object of the invention is to provide an oscillator which is capable of producing either intermittent or continuous high frequency oscillations without breaking or interrupting the current flow through the oscillator. Another object of the invention is to provide means actuated by a telegraph key for separating the electrodes in the oscillator to make or break the spark gap formed between the electrodes when telegraphing; and also to provide a means for maintaining a spark gap between the electrodes when the oscillator is employed for telephonic communication. Further objects will hereinafter appear.

The invention consists of the parts and the construction and combination of parts as hereinafter more fully described and claimed, having reference to the accompanying drawings, in which—

Figure 1 is a diagrammatic view showing a wireless system adapted to be used either as a wireless telephone or telegraph station for sending.

Fig. 2 is a central, vertical section of the oscillator employed in the system.

Fig. 3 is a diagrammatic view, showing the oscillator connected with a source of alternating current supply which is employed when the apparatus is used for telegraphing.

Referring to the drawings in detail and particularly to Fig. 1, I have shown the connection and position of the oscillator with relation to the several other instruments required in a radio station adapted for sending either by telegraph or telephone, in which G indicates a direct current generator, which, in the present instance, is shown as connected in series with the electrodes 2 and 3 of the oscillator; a choke or impedance coil 4 being interposed on one side of the circuit while a rheostat or variable resistance 5 and an impedance coil 6 are interposed on the other side of the circuit. The main switch 7 may also be placed in the circuit to open or close the circuit formed through the electrodes of the oscillator.

This part of the station completes the direct current supply circuit while the primary oscillating circuit passes through a condenser C which is connected in series with the primary coil D of a high frequency transformer connected across the terminals of the electrodes 2 and 3, between which is formed the spark gap of the oscillator. The primary oscillating circuit is here shown in heavy lines to distinguish it from the current supply circuit and the secondary oscillating circuit which consists of the secondary coil E of the transformer, an antenna F and the transmitter H which is connected, as shown at K, with the ground.

The oscillator proper consists of a cylindrical container 8 provided with a cover 9, preferably constructed of insulating material, upon which is mounted an electromagnet 10 of suitable construction. Slidably mounted in the iron core 11 of said magnet is a rod 12, constructed of a suitable non-magnetic material, and secured on the lower end of the rod is a metal electrode 2 which is positioned in direct alinement with a second metal electrode 3 carried by a bracket 15, which in turn is supported by the cover 9 by means of a pair of rods 16 which are preferably covered with insulating material, such as shown at 17, the major portion of the rod 12 being also covered with an insulating material to prevent leakage of current through the fluid 8^a in which the electrodes are submerged.

The electrodes employed may be constructed of any suitable metal, but preferably of tungsten, as practical experience has shown that this metal has less tendency to corrode

or burn away due to the heat created by the spark gap than any other metal so far used.

Mounted in the upper end of the core 11 is an adjusting screw 17, which is provided for the purpose of limiting the lift of the rod 12 carrying the electrode 2, and interposed between the lower ends of the core and an armature 18 secured on the rod is a spring which serves the function of normally maintaining the upper electrode in contact with the lower electrode 3. The terminals of the magnet 10 are supplied with current from the generator G, one terminal being connected through a wire 19 with one terminal of the rheostat, as shown, while the opposite terminal of the magnet is connected through a wire 20 with another terminal of the rheostat or variable resistance, indicated at 5; a telegraph key 21 and a switch 22 being interposed in this circuit for purposes hereinafter to be described.

The amount of current required to energize the magnet 10 sufficiently to separate the electrodes is comparatively small; hence the reason for connecting the magnet circuit as shown with the variable resistance. The transmitter H is, as previously described, connected between the secondary coil E of the high frequency transformer and the ground connection K. It is also connected with a switch 23 which permits bridging of the transmitter when the telegraph is being employed.

With the switch 7 closed and the generator G operating, the operation will be as follows: If it is desired to send a message by telegraph it is only necessary to close the switch 23 and open the switch 22. The key 21 may then be depressed to send the dot and dash message in the usual manner, closing of the terminals of the keys causing the magnet 10 to become energized and lift the upper electrode, while breaking of the contacts of the key permits the upper electrode to contact with the lower electrode; high frequency oscillations or magnetic waves being transmitted when the electrodes are separated and the spark gap is formed while no oscillations are transmitted the moment the electrodes contact.

While the spring 18 is here shown for the purpose of rapidly closing the gap between the electrodes, I wish it understood that this is not essential as the weight of the rod supporting the upper electrode practically serves the same function.

In actual practice it has been found that vibrations, no matter how rapid, when transmitted to the key 21, cause the oscillator to respond; that is, it has been found impossible to operate the key so fast that the oscillator will not respond. An important feature which should be observed in connection with the present apparatus is the fact that the operation of the key 21 does not make or break the current flow through the oscillator but it merely makes or breaks the spark gap formed between the electrodes when these are separated. The current flow is thus continuous but the oscillations produced are interrupted.

If it is desired to transmit a message by telephone, it will only be necessary to close the switch 22 to maintain a permanent spark gap between the electrodes of the oscillator and to open the switch 23 to permit the transmitter to be employed. An operator can, therefore, send a message either verbally or by telegraph and he can readily stop during a conversation to spell any word which may not be understood merely by reversing the position of the switches and spelling the word through the key 21. He may also listen in at the same time and can readily receive under such conditions as no oscillations are being transmitted from the sending station excepting when the electrodes are separated. He may, therefore, be in communication with any other station and can immediately receive any message therefrom by merely permitting the electrodes to contact to close the spark gap, thus preventing the production of the high frequency magnetic waves which would interfere with the receiving end of the station.

The electrodes may be submerged in any suitable liquid, but preferably distilled water, and should under all conditions be constructed of a slow burning metal as it thereby eliminates constant adjustment and care on the part of the operator. Actual practice has determined that tungsten, when employed under the conditions here described, only burns away to the extent of 6/1000 of an inch each hour if continuous oscillations are being transmitted. It can, therefore, readily be seen that comparatively little care is required when tungsten and distilled water are employed.

By referring to Fig. 3 it will be seen that the electrodes of the oscillator are connected with an alternating current generator, such as shown at 30, and that the upper electrode is raised when it is desired to secure a spark gap by means of a magnet similar to that shown in Figs. 1 and 2. The magnet is, however, in the present instance energized from a separate source of current supply, as for instance a battery 31, the circuit through the magnet being broken by a telegraph key, as previously described.

The apparatus shown in Fig. 3 can only be used for radio telegraphy, as the alternating current employed renders it unsuitable for telephonic communication. It is, however, ideal for radio telegraphy and has advantages not secured when a direct current is employed. For instance, by employing an oscillator constructed as here shown in connection with an alternating current

circuit it becomes possible to use a low tension current, say five hundred volts. This is due to the fact that the electrodes of the oscillator are normally in contact with each other and are only slightly separated when oscillations are to be created. The electrodes of the oscillator being submerged are absolutely noiseless and they are under all conditions kept cool, as the liquid in which they are submerged conducts the heat away from the electrodes. Another advantage obtained by supplying the oscillator with alternating current is the production of a musical note, due to the cycle of alternations of the current flow, thus obviating the necessity of employing an interrupter for this purpose.

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

1. In a high frequency oscillator, a pair of electrodes, means for maintaining the electrodes submerged in distilled water, means for maintaining a constant current flow through the electrodes, and means for maintaining the electrodes slightly separated or for intermittently separating the same to establish a continuous or intermittent spark gap between the electrodes to permit the production of continuous or intermittent high frequency oscillations of the circuit or current flow through the electrodes.

2. In a high frequency oscillator, a pair of metal electrodes, means for maintaining said electrodes submerged in distilled water, means for maintaining a constant current flow through the electrodes, and a solenoid circuit controlled by a telegraph key for intermittently separating the electrodes.

3. A system for the production of intermittent or continuous high frequency oscillations, comprising a source of supply and leads therefrom connected to the primary coil of a high frequency transformer, a variable resistance and impedance interposed in one of the leads and an impedance coil and condenser interposed in the other lead, a pair of electrodes between the leads forming a separate circuit for the condenser and primary coil, and a solenoid circuit in shunt with the leads from the source of supply for raising one of the said electrodes.

4. In an apparatus for the production of intermittent or continuous high frequency oscillations, an oscillator comprising a pair of submerged electrodes, means for maintaining a continuous current flow through said electrodes, said electrodes adapted to normally contact with each other, a magnet adapted to separate the electrodes to form a spark gap to produce and radiate high frequency oscillations of the current flow through the electrodes, means connecting the terminals of the magnet with the source of current supply, a telegraph key interposed in said circuit to make and break the circuit through the magnet, and a switch in the circuit adapted to maintain a continuous current flow through the magnet to maintain a permanent spark gap between the electrodes.

5. In an apparatus for the production of intermittent or continuous high frequency oscillations, an oscillator comprising a pair of submerged electrodes, means for maintaining a continuous current flow through said electrodes, said electrodes adapted to normally contact with each other, a magnet adapted to separate the electrodes to form a spark gap to produce and radiate high frequency oscillations of the current flow through the electrodes, a separate shunt circuit connecting the terminals of the magnet with the source of current supply, a telegraph key interposed in said circuit to make and break the circuit through the magnet, a switch in the circuit adapted to maintain a continuous current flow through the magnet to maintain a permanent spark gap between the electrodes, a high frequency transformer, a primary coil in said transformer connected in series with the electrodes of the oscillator, a condenser interposed between one of the electrodes and the primary coil, a secondary coil in the transformer, an antenna connected with one terminal of said secondary coil, a ground connection for the opposite terminal of the secondary coil, a transmitter interposed in said ground connection, and a bridging switch on the transmitter.

6. In an apparatus for the production of intermittent or continuous high frequency oscillations, an oscillator comprising a tank adapted to contain distilled water, a stationary electrode submerged in said water, a vertically movable rod, a second electrode carried by said rod adapted to normally engage the first named electrode, means for maintaining a continuous circuit through the electrodes, a solenoid circuit connected in shunt therewith, said solenoid being adapted to raise the rod with attached electrode for separating said electrodes.

7. In an apparatus for the production of intermittent or continuous high frequency oscillations, an oscillator comprising a tank adapted to contain distilled water, a cover for said tank, a pair of rods extending downwardly from the cover, a plate connecting the lower ends of the rods, an electrode supported by said plate and submerged by the distilled water, a solenoid magnet supported by the cover, a rod extending through the solenoid forming an armature therefor, an electrode on the lower end of said rod adapted to normally contact with the first named electrode, an adjusting screw carried by the magnet adapted to regulate the lift of the armature rod and the electrode carried

thereby, a source of direct current supply, means for maintaining a continuous circuit through the electrodes, means connecting the magnet with said source of current supply, and a telegraph key interposed in the circuit adapted to make and break the circuit through the magnet.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

ALPHONSUS L. GOLDEN.

Witnesses.

W. W. HEALEY,

M. E. EWING.