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APPARATUS FOR PRODUCING ELECTRIC OSCILLATIONS.

APPLICATION FILED APR. 12, 1910.

1,001,975.

Patented Aug. 29, 1911.

3 SHEETS—SHEET 1.

Fig. 1.

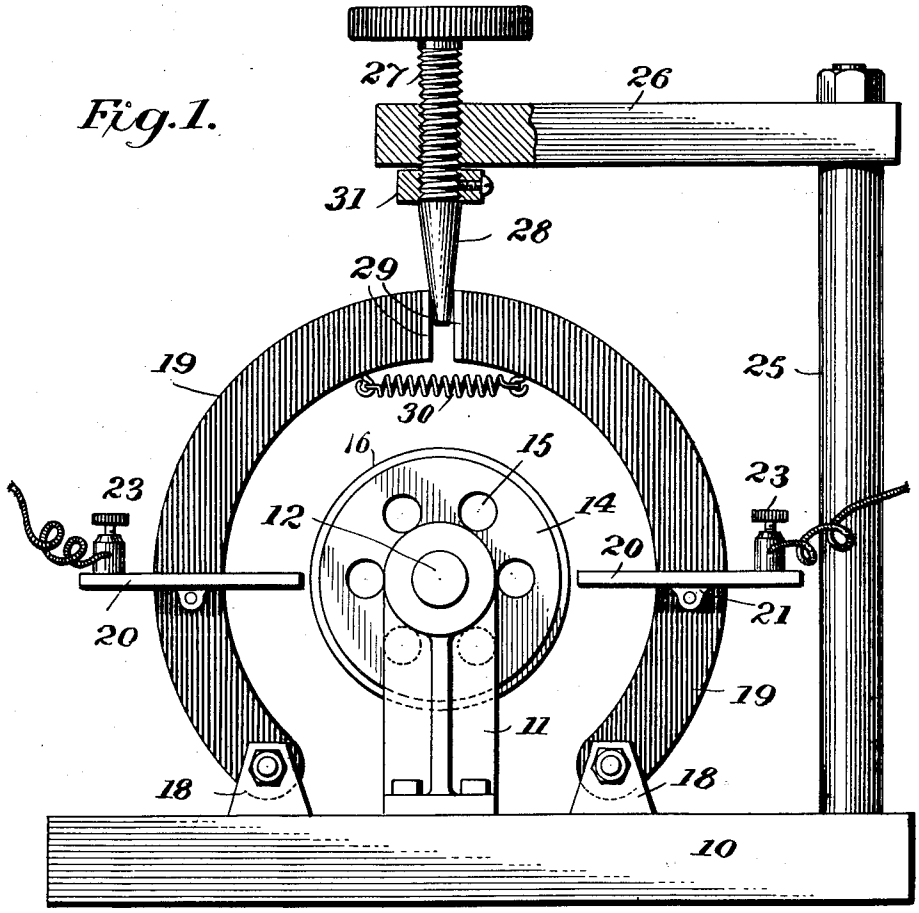


Fig. 7.

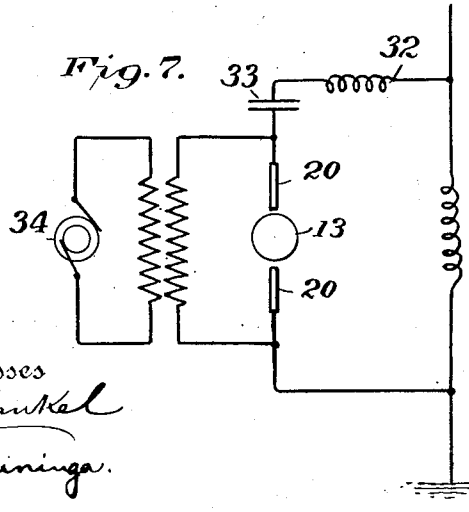
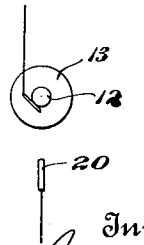


Fig. 8.



Witnesses

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3 SHEETS—SHEET 2.

Fig. 2.

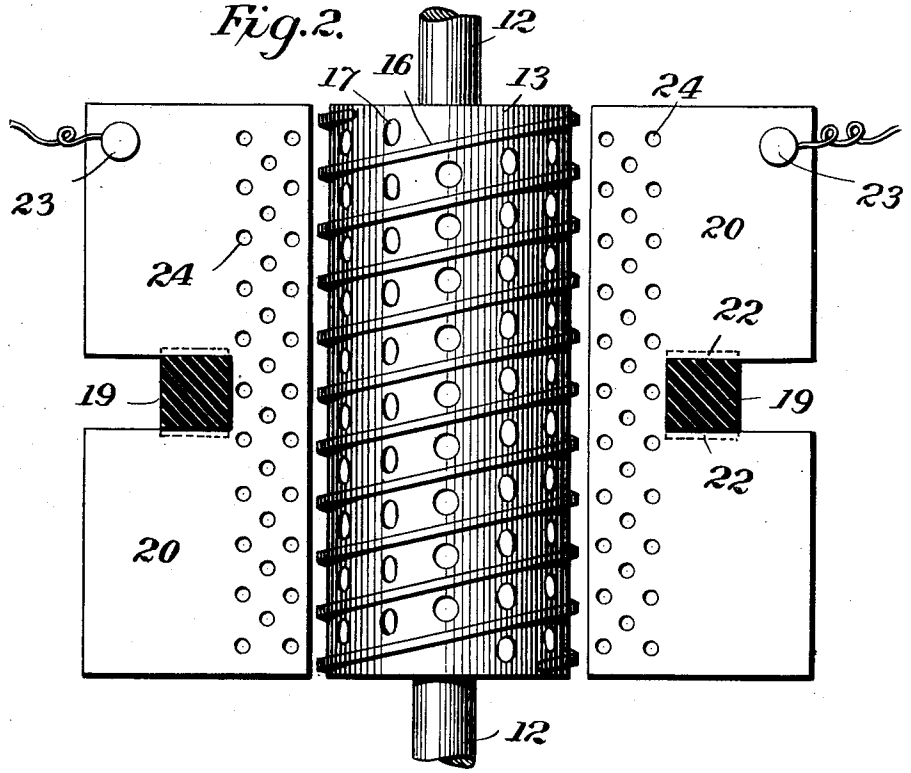
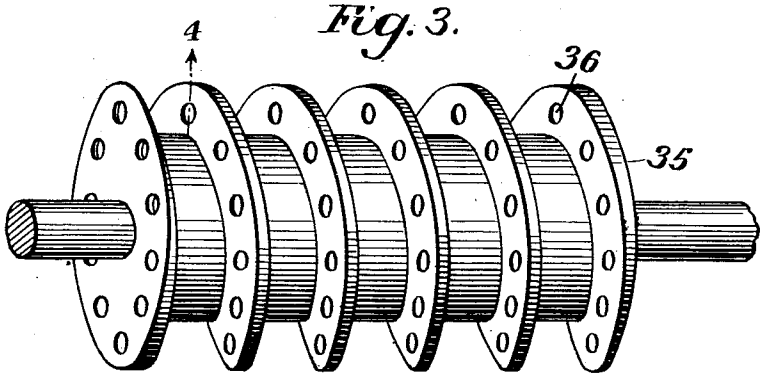


Fig. 3.



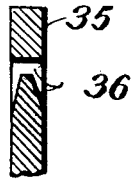


Fig. 4

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3 SHEETS—SHEET 3.

Fig. 6.

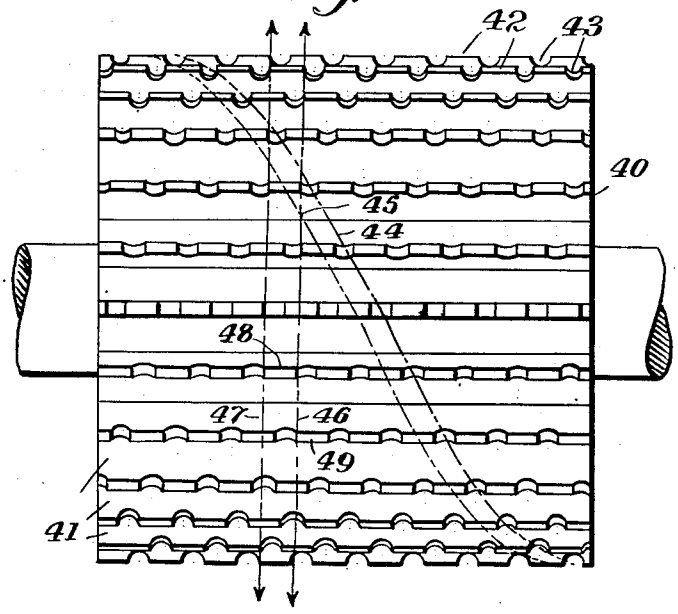
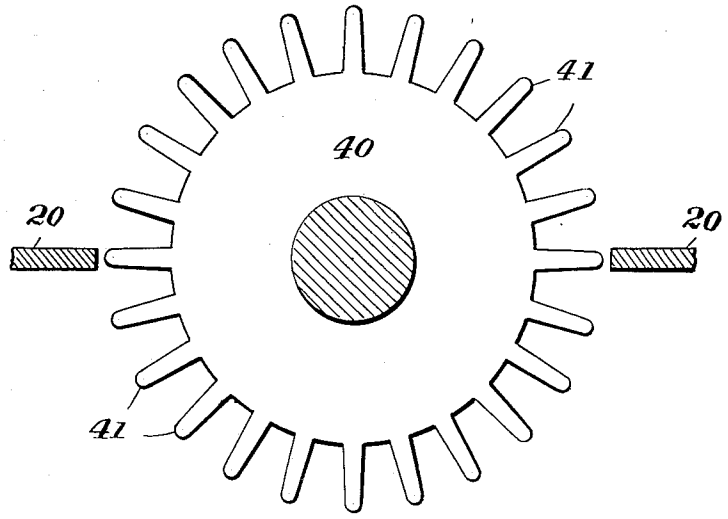


Fig. 5.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR PRODUCING ELECTRIC OSCILLATIONS.

1,001,975. Specification of Letters Patent. Patented Aug. 29, 1911.

Application filed April 12, 1910. Serial No. 555,057.

To all whom it may concern:

Be it known that I, JOSEPH MURGAS, a citizen of the United States, and resident of Wilkes-Barre, county of Luzerne, and State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Producing Electric Oscillations, of which the following is a specification.

This invention relates to apparatus for producing electric oscillations of high frequency.

If an oscillatory discharge takes place in a short spark gap of which the terminals are cool the spark gap exerts a great damping effect on the oscillatory discharge and suppresses the same after a few oscillations. If a closed oscillatory circuit containing such a spark gap is suitably connected with an aerial wire the oscillating circuit and the aerial wire oscillate freely after having received the first impulse from the spark gap, and thus a train of undamped or slightly damped oscillations is produced. The quenching of the spark is increased by shortening the gap, but in order to obtain satisfactory results the spark gap must be kept cool and the formation of an arc must be prevented.

The object of this invention is to provide convenient apparatus for producing quenched spark oscillations and to provide means whereby the electrodes or terminals of the spark gap may be kept cool and in good condition.

The invention will be described in connection with the accompanying drawings, in which:

Figure 1 is an elevation of the apparatus; Fig. 2 is a section taken above the electrodes: Fig. 3 is a perspective view showing another form of rotary member; Fig. 4 is a section on the line 4—4 of Fig. 3; Fig. 5 is an end view showing another form of this invention; Fig. 6 is a detail of the rotary member shown in Fig. 5; Fig. 7 is a diagram of a sending station showing an application of this invention; Fig. 8 is a diagram showing another modification.

A base 10 of marble or other suitable insulating material has mounted thereon a pair of pedestals 11 which form bearings for a shaft 12. A hollow cylinder 13 is mounted upon this shaft by means of the disk-shaped ends 14 provided with a series of apertures 15. The surface of the cylinder has formed thereon ridges 16 arranged in the form of a helix. The ridges may be formed in various ways. A suitable method consists in cutting a helical groove on the cylinder and then laying in this groove a wire preferably of square cross section, the wire being secured in place in the groove by soldering, brazing, or in any other suitable manner. This wire is preferably formed of electrolytic copper and the cylinder is preferably formed of brass. The outer surface of the cylinder is provided with a series of holes 17, the holes being arranged between successive spirals.

The base has mounted thereon a pair of lugs 18 in which are pivotally mounted a pair of supports 19, to which are secured the electrodes 20. These electrodes comprise flat plates of copper and are mounted in the support by forming grooves 22 in the supports. The plates are secured in position by means of suitable fastenings extending through ears 21 on the electrodes. The electrodes are provided with binding posts 23 and have formed therein a series of apertures 24.

A vertical post 25 is mounted upon the base and has secured at its upper end an overhanging member 26 in which is mounted an adjustable screw 27. The lower end of this screw has formed thereon a cam member 28 which is arranged to engage the ends 29 of the supports 19. The supports are normally held in engagement with the cam member 28 by means of a spring 30. The supports 19 are preferably formed of insulating material and the ends 29 are preferably metallic plates so as to prevent undue wear. The adjusting screw is provided with an adjustable collar 31 so as to form a stop whereby the inward movement of the electrodes is limited.

The shaft 12 is connected to a suitable motor through an insulating coupling so that the motor will rotate the cylinder between the electrodes. The electrodes and the cylinder or rotary member form together a double spark gap. During the rotation of the cylinder air will be drawn in through the apertures 15 and will be thrown out by centrifugal force against the electrodes, and thus the electrodes and the rotary member will be thoroughly cooled. The cooling of these electrodes is facilitated due to the presence of the holes 24 in the plates. In view of the fact that the discharge takes place between the spiral ridges

16 and the plates 20 it is insured that new surfaces of the plates and the spiral will come into operation continually and thus the pitting and wearing down of the co-operating surfaces are avoided.

The length of the spark gap may be closely adjusted by means of the screw 27 and its wedged member 28, and it will be seen that this wedge member adjusts the electrode simultaneously toward and from the cylinder 13.

The invention is shown applied to a telegraph sending station in Fig. 7. In this figure the electrodes 20 and the cylinder 13 are connected in series with the oscillating circuit which contains an inductance 32 and a capacity 33, both of which may be variable for the purpose of adjustment. The energy is furnished by means of a suitable source of current as an alternator 34 through the step-up transformer, or by a source of direct current.

In Figs. 3 and 4 is shown a rotary member which is especially adapted for large stations using large amounts of energy. In this case the rotary member consists of a solid member which has the helical ridges 35 turned thereon. The ridges have holes 36 formed therein which are shaped as shown in Fig. 4. By giving the holes this shape the rotary member acts as a fan and throws the air out by centrifugal force against the plates 20, it being understood that in this particular form the other parts are of similar construction to that shown in Fig. 1. The circulation of the air through the holes 36 will not only insure that the plates 20 are kept cool, but will also insure that the ridges 35 are kept cool.

In Figs. 5 and 6 the rotary member 40 is provided with a series of longitudinal ribs 41, and these ribs have teeth 42 thereon, formed by cutting notches 43. These notches are cut in such a manner that the teeth on adjacent ribs will be displaced longitudinally of the rotary member. This may be accomplished by cutting the notches in a helical line around the rotary member as shown by the line 44 which is drawn through the notches, and the centers of the teeth are also located on a helical line as shown by the dotted line 45. The pitch of the helix may vary to suit requirements but it is preferably so proportioned that a new surface of the plate 20 will come into play whenever another tooth is brought into co-operation therewith. This is shown in Fig. 6, where the lines 46 and 47 are drawn vertically, and it will be seen that the tooth 49 is displaced from the tooth 48 so that tooth 49 will coöperate with a new surface on the stationary plate or plates 20.

By means of this construction, the spark gap is broken up into a series of gaps and the formation of an arc is prevented, since new surfaces on the rotary member and the plates come into play continually, thus giving the spark gap terminals time to cool. The provision of teeth or ribs on the rotary member will produce a distinct tone in a distant receiver and the pitch of this tone will vary with the speed of the rotary member and with the number of teeth. This construction is therefore well adapted for wireless telegraphy, since tones are produced which can be readily distinguished and which may moreover be used in the systems described in my prior Patents Nos. 876,383, and 917,103.

It may in some cases be desirable to utilize the rotary member as one of the electrodes so as to dispense with one of the plates 20, as shown in Fig. 8, where connection to the rotary member is made through a brush, but it is preferable to use the double spark gap arrangement shown in the drawings.

It will thus be seen that this invention provides an efficient apparatus for producing a quenched spark since the electrodes and the cylinder are so formed that they may be thoroughly cooled.

The operative surfaces of the cylinder and the electrodes continually move relatively to each other so that a new surface is continually in operation. In this way the cooling of these surfaces is facilitated for the following reasons. The spark is split up into a large number of small sparks and the operative surface of the rotating member is continually moved longitudinally of the plates or electrodes, so that a new spark surface comes into play continually both on the rotating member and on the stationary plates or electrodes. In this way the spark has not time to heat up any point on the electrodes to any extent, and due to the fact that these electrodes are of metal having a high heat conductivity, the heat due to the sparks is rapidly dissipated. The construction of the rotating member, therefore, insures that the spark gap will be kept cool. The cooling action is especially efficient if the distance between the helices as compared to their thickness is great. The fan feature may therefore be omitted.

It will be noted that in Figs. 2 and 3 the apertures 17 and 36 are placed either between the ridges or in the ridges themselves so that the operative surface of the ridges is entirely unbroken, whereby, the spark gap will be uninterrupted, and will therefore be of constant length. This renders these forms especially adaptable for wireless telephony, while the form shown in Figs. 5 and 6 is especially adapted for wireless telegraphy.

It is obvious that various changes may be made in the details of construction without departing from this invention, and it is therefore, to be understood that this inven-

tion is not to be limited to the specific construction shown and described.

What I claim is:

1. In an apparatus of the class described, the combination with an electrode, of a rotary member coöperating with said electrode to form a spark gap, said electrode being provided with perforations adjacent the spark gap, and fan elements on said rotary member.

2. In an apparatus of the class described, the combination with an electrode, of a rotary member coöperating with said electrode to form a spark gap, said electrode being provided with transverse perforations adjacent the spark gap, and means associated with said rotary member to direct an air current on said electrode and rotary member.

3. In an apparatus of the class described, the combination with the rotary drum, of a pair of electrode plates extending on opposite sides of and axially of the drum to form a spark gap therewith, said plates being provided with perforations extending therealong and adjacent the drum.

4. In an apparatus of the class described, the combination with a set of electrodes, of a rotary member between said electrodes and forming with said electrodes a spark gap, and means for adjusting said electrodes simultaneously away from said rotary member.

5. In an apparatus of the class described, the combination with an electrode, of a rotary member forming a spark gap therewith, and ridges on the electrode engaging face of said rotary member inclined at an angle with respect to the axis thereof.

6. In an apparatus of the class described, the combination with an electrode, of a cylindrical member forming a spark gap therewith, said rotary member being provided with helical circumferential ridges.

7. In an apparatus of the class described, the combination with a set of electrodes, of a rotary cylindrical member between said electrodes and forming therewith a spark gap, said rotary member being provided with continuous circumferential ridges.

8. In an apparatus of the class described, the combination with a set of electrodes, of a rotary cylindrical member between said electrodes and forming therewith a spark gap, said rotary member being provided with continuous circumferential ridges, and said rotary member being provided with apertures to cause a radial cooling current to be directed against said ridges and electrodes.

9. In an apparatus of the class described, the combination with a rotary member, of an electrode on each side of said rotary member and forming therewith a spark gap, a movable support for each of said electrodes, and means for simultaneously adjusting said supports.

10. In an apparatus of the class described, the combination with a rotary member, of an electrode on each side of said rotary member and forming therewith a spark gap, a movable support for each of said electrodes, and a cam member for adjusting said supports.

11. In an apparatus of the class described, the combination of a stationary and a movable member forming a spark gap, and means whereby the operative surface of one of said members is moved along and at an angle to the operative surface of the other member during their relative movement.

12. In an apparatus of the class described, the combination with a member, of a member relatively movable thereto, said members forming a spark gap, and projections on the gap face of said movable member, extending diagonally of the axis of said member.

13. In an apparatus of the class described, the combination with a member, of a revoluble member coöperating with said member to form a spark gap, and projections extending around said revoluble member in a substantially helical line.

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

JOSEPH MURGAS.

Witnesses.

JOHN P. POLLOCK,

J. CLAIRE JOHNSTON.