C. D. HERROLD.

OSCILLATOR.

APPLICATION FILED OCT. 20, 1915.

1,222,761.

Patented Apr. 17, 1917.

2 SHEETS—SHEET 1.

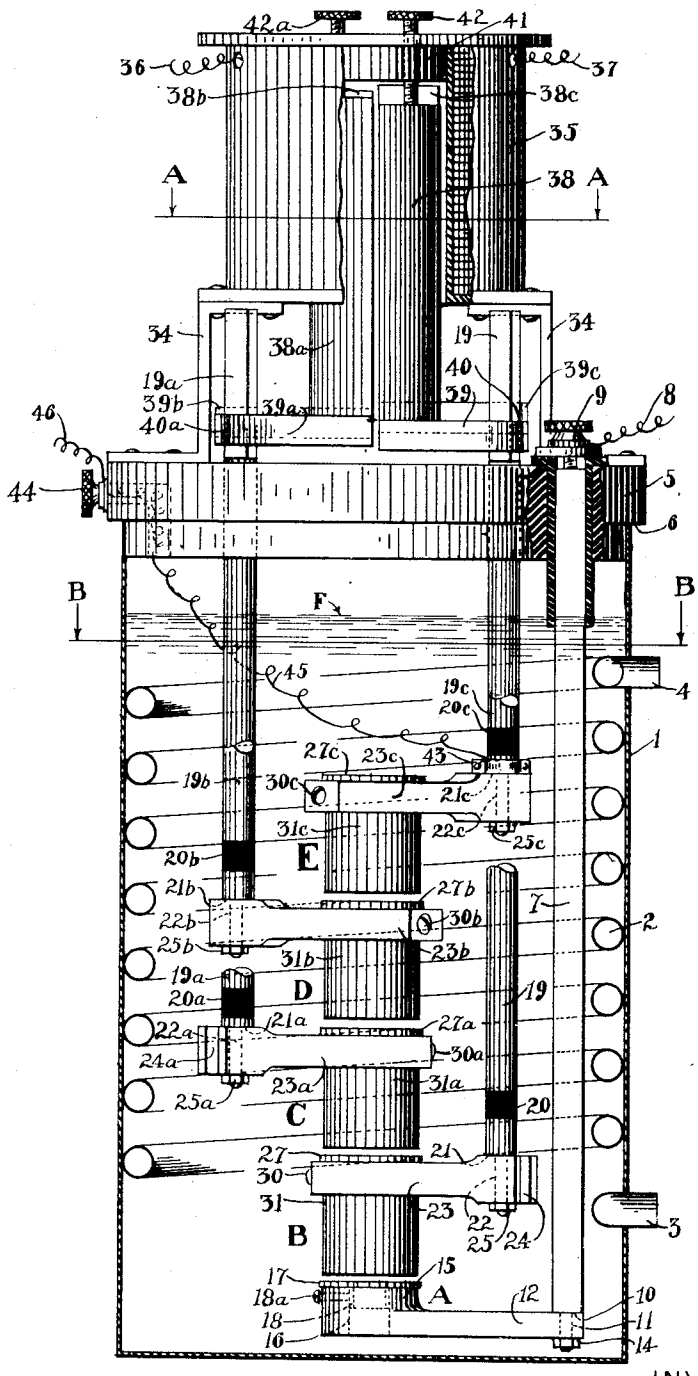


FIGURE 1

INVENTOR

Charles D. Herrold

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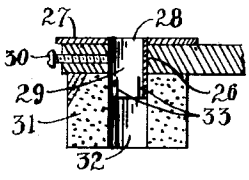


FIGURE 5

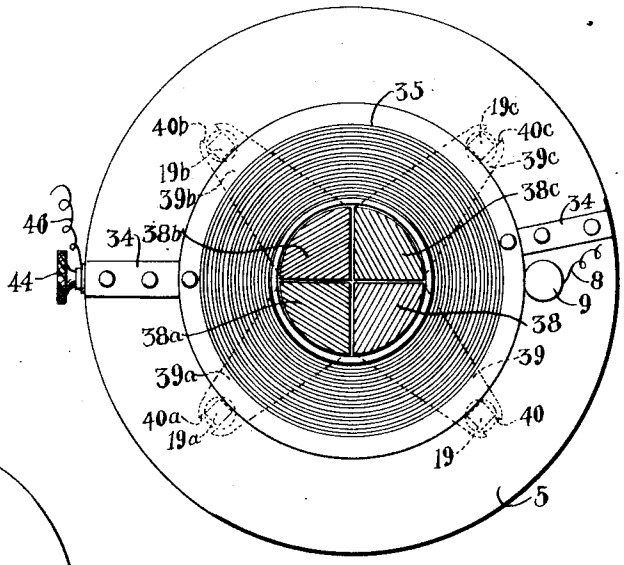


FIGURE 3

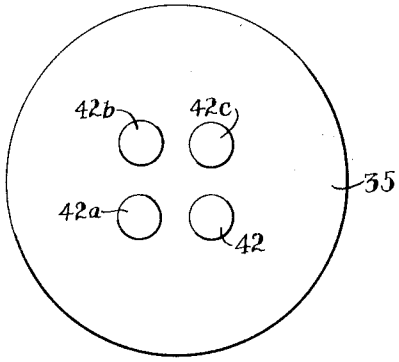


FIGURE 2

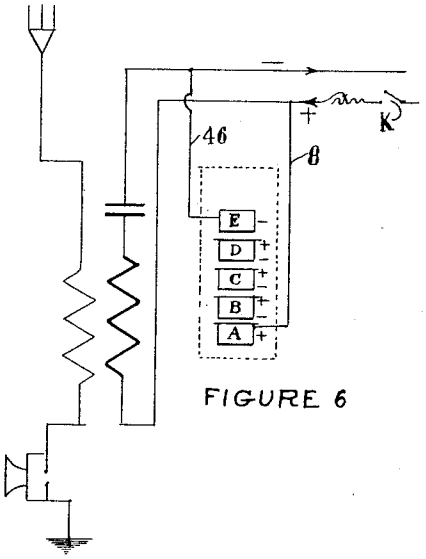


FIGURE 6

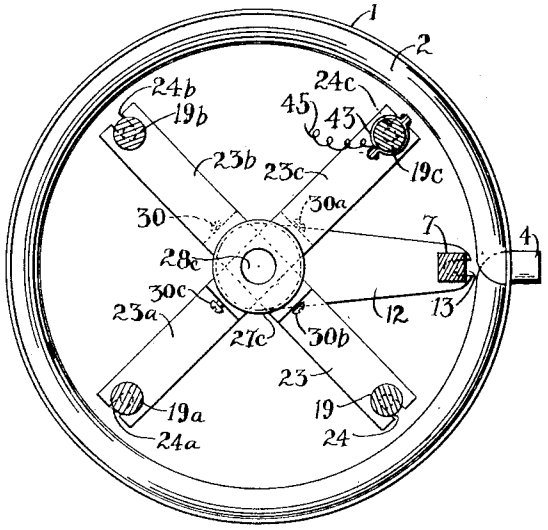


FIGURE 4

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UNITED STATES PATENT OFFICE.

CHARLES D. HERROLD, OF SAN JOSE, CALIFORNIA.

OSCILLATOR.

1,222,761. Specification of Letters Patent. Patented Apr. 17, 1917.

Application filed October 20, 1915. Serial No. 56,932.

To all whom it may concern:

Be it known that I, CHARLES D. HERROLD, a citizen of the United States, residing at San Jose, in the county of Santa Clara and State of California, have invented certain new and useful Improvements in Oscillators, of which the following is a specification.

My invention relates to an improved apparatus for the production of oscillating currents, and the objects of my invention are to produce a device of the character mentioned, 1st, that will comprise the necessary number of gaps in a single unit, or, in other words, that will combine any required number of sets of electrodes or oscillators in one compact, light and efficient device; 2nd, in which a series of electrodes are adjustably, independently, and axially positioned in an imperfectly conducting fluid; 3rd, in which a divided solenoid core is used to permit the separate adjustment of each electrode and yet allow the simultaneous striking of all the electrodes through the magnetic action of a single solenoid; 4th, in which a series of steady, uniform, oscillating or active arcs free from beats are obtained in a single medium of imperfectly conducting fluid; 5th, in which a series of electrodes are axially positioned and capable of being uniformly spaced in such a manner that their opposing faces will be parallel; 6th, in which the electrodes are so secured in position as to be capable of quick and easy replacement with new ones when desirable, and, 7th, in which the losses sustained in the multiple arc systems as now used are eliminated.

In the accompanying drawings, in which similar reference characters refer to similar parts throughout the several views,—

Figure 1 is an elevation of my device partly in section and parts being broken away.

Fig. 2 is a plan view of the solenoid.

Fig. 3 is a sectional view on line A—A of Fig. 1.

Fig. 4 is a sectional view on line B—B of Fig. 1.

Fig. 5 is a detail vertical section through one electrode.

Fig. 6 is a diagram showing the position of my device in the electric system.

Referring now more particularly to the drawings, 1 indicates a metallic vessel with a spiral water tube 2 passing around its inner periphery and having an inlet as at 3 and an outlet as at 4, said inlet and outlet being connected to a water system not shown by means of which a circulating body of water is obtained in said tube 2. At 5 is shown a top made of any suitable insulating material, as lavite, having a shoulder 6 which rests upon the upper edge of vessel 1. Support 7 is a conductor of electricity rigidly positioned in top 5 and connected to electricity feed wire 8 by any suitable connection as 9. Support 7 extends down to within a short distance of the bottom of vessel 1 and has a shoulder 10 and threaded projection 11 formed on its lower end. Arm 12 is forked as shown at 13 and adapted to engage projection 11 and shoulder 10 and is fastened rigidly in position by nut 14. The outer end of arm 12 is enlarged to form a circular head 15, said head 15 being provided with a circular hole formed in the center thereof as shown at 16. At 17 is shown a comparatively thin disk of copper having a hole formed in the center thereof in which is secured one end of brass tube 18, the projecting portion of tube 18 fitting closely in hole 16 in head 15, secured by set screw 18^a and securely holding disk 17 in the position shown. Supporting bars 19, 19^a, 19^b and 19^c and the parts operating them and the parts which they support are constructed in exactly the same manner, therefore for the purpose of this description but one will be described in detail and the corresponding parts of the others indicated by the proper numeral and letter on the drawing.

Supporting bar 19 is preferably circular in cross section with its upper end squared, and may be made entirely of insulating material or have a section of insulating material as shown at 20. The lower end of bar 19 is provided with a shoulder 21 and a threaded projection 22. A bar as 23 is forked on one end as at 24 and adapted to engage said projection 22 and shoulder 21 and is held rigidly and in a horizontal position by nut 25. Near the outer end of bar 23 is formed a vertical hole 26. At 27 is shown a copper disk having a hole 28 formed in its center in which is secured one end of a brass tube 29, said brass tube 29 fitting snugly in said hole 26 and projecting below the lower side of bar 23 and held securely in position by set screw 30. At 31 is shown a carbon cylinder of the required length provided with a vertical hole 32 adapted to engage brass tube 29. When

carbon 31 is placed in position as shown in Fig. 5 it is firmly secured in said position through the spreading action of the lower portion of tube 29, said tube 29 having two or more vertical kerfs cut therein as shown at 33 for this purpose and also to facilitate the removal of the several parts when desired. Supporting bars 19 to 19ᵉ pass vertically through top 5 and operate freely therein, said top 5 acting as a positioning and guiding member for said supporting bars. Secured to top 5 in any suitable manner as by brackets 34, is a solenoid 35 of the required attractive force, the feeding and discharge wires being indicated at 36 and 37 respectively, the same being connected to any suitable source of direct current. The core of solenoid 35 is divided into a number of parts corresponding to the number of supporting bars 19 used, in this case four, each part being insulated from and acting independently of the others. That portion of the core operating supporting rod 19 is shown at 38 and has a horizontal arm 39 projecting from its lower end. Arm 39 is forked as shown at 40 and engages the upper squared end of supporting bar 19 with a sliding fit. In the upper central portion of solenoid 35 is positioned a magnetic stop 41, of soft iron tapped to receive set screw 42 against which the upper end of core part 38 operates. At 43 is shown a collar fitted to supporting bar 19ᵉ below the insulated portion 20ᵉ, the same being electrically connected to binding post 44 by wire 45. A discharge wire 46 is connected to binding post 44, feed wire 8 and discharge wire 46 being connected to a source of direct current supply and also to the terminals of the oscillating shunt circuit as shown in Fig. 6, the switch being indicated at K.

In the following description of the adjustment and operation of my device the several double electrodes and the terminal electrode are referred to by their respective letters as shown in Fig. 1, each double electrode comprising a carbon and a copper disk secured and supported substantially as shown and described.

The several parts being assembled as described, terminal electrode A and double electrodes B, C, D and E are placed in perfect alinement and secured by their respective nuts 25 to 25ᵉ, and placed in receptacle 1 in, say, an alcohol bath rising to point F so as to entirely cover said electrodes.

The current now turned into feed wire 8 passes vertically through members A, B, C, D and E and out through discharge wire 46.

Set screws 42 to 42ᵉ are so adjusted that the vertical movement of core parts 38 to 38ᵉ will be exactly the distance required to properly space the four double electrodes, for as the solenoid operates the core parts said core parts and their respective arms become energized and form magnetic lifts which instantly grasp their respective supporting bars 19 to 19ᵉ and raise the same vertically and thereby space double electrodes B, C, D and E simultaneously. If the space required between each two double electrodes is one unit, then when the device is set in motion from a position of rest double electrode B will raise one unit, C will raise two units (one for itself and one for B), D will raise three units and E will raise four units. It is evident that as the carbon in each electrode wears away a continual and unequal adjustment of the several electrodes will be required to keep the length of the several gaps uniform. When any one or all of the carbons become so burned away that the arcs lose their efficiency it is only necessary to break the circuit at switch K whereupon the solenoid core parts become deënergized and the magnetic grip of bars 39 to 39ᵉ is destroyed and thereby allowing each of carbons 31 to 31ᵉ to drop into contact with the copper disk below. If the electrodes are spaced one unit apart and each carbon is worn down one unit, then double electrode B must drop two units, C must drop four units, D six units and E eight units. Closing switch K again energizes the core parts, whereupon bars 39 to 39ᵉ instantly resume their magnetic grip upon their respective supporting bars 19 to 19ᵉ and through them raise carbons 31 to 31ᵉ, thus equally and simultaneously spacing the same as hereinbefore described.

The length of the several bars 19 to 19ᵉ is sufficient to permit the proper adjustment of all the electrodes until they are so worn as to require renewal, whereupon the top 5, with the parts attached thereto, is removed from vessel 1, nuts 25 to 25ᵉ are loosened and double electrodes B, C, D and E are swung clear of each other. Since tubes 29 have kerfs 33 cut in them the carbons are readily removed. Screws 30 to 30ᵉ are now loosened and disks 27 to 27ᵉ and tubes 29 to 29ᵉ taken off and discarded. After new parts have been fitted as hereinbefore described they are again placed in perfect alinement and replaced in vessel 1 ready for use.

By means of the mechanism above set forth the opposing surfaces of the paired electrodes are not only properly spaced but are also held in parallel relation to each other, which is a necessary condition for securing the desired results.

While the arcs would, perhaps, usually be formed by "striking," they can be formed in a series of this kind, by holding the electrodes in spaced relation to each other and forcing a high voltage current through for

a moment at the start, thus breaking down a path which permits the easy formation of the arcs.

Since all of the double electrodes are in perfect alinement and each is provided with a vertical hole through its center, a path of travel for a large portion of the heated bath medium and gases and vapors formed by the arcs is provided in such a position as to generate the desired circulation of the cooling fluid, the same being drawn from all sides at the bottom, passing directly up through the center of said double electrodes and up their outer peripheries and outwardly again at the top to be cooled by the cooling fluid in tube 2.

Inasmuch as the electrodes are axially alined and a continuous current is used, persistent, uniform undamped oscillations are obtained without any of the losses sustained in those devices in which several pairs of electrodes are assembled independently of each other and connected in series. A more perfect valve action is also obtained in this arrangement of electrodes because it takes place simultaneously through all of the gaps and is not weakened as must necessarily be the case when the oscillators are independently positioned and connected in series, causing time lag in the circuit and non-synchronism in the valves of the series.

While I have herein shown and described in detail the preferred embodiment of my invention, it is understood that changes in form, proportions and materials and minor changes in construction may be resorted to within the scope of the appended claims.

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

1. In an oscillator, an electrode removably positioned in an imperfectly conducting fluid and a plurality of electricity conducting members in axial alinement with said electrode and adapted to form a plurality of arc gaps, and means operatively connected to each of said conducting members for simultaneously and equally spacing the several members and holding the same in said spaced relation.

2. In an oscillator, a plurality of arc gaps formed by a plurality of axially alined, simultaneously adjustable, interspaced electricity conducting members operatively positioned in an electrical circuit, each of said members comprising a metallic disk and a tubular carbon removably attached to each other.

3. In an oscillator, an electrode removably positioned in an imperfectly conducting fluid and a plurality of adjustable electricity conducting members axially alined with said electrode and operatively positioned in an electrical circuit, and means for adjusting said members, said means comprising a solenoid having a divided core, each of the parts of said divided core being operatively connected to one of said members.

4. In an oscillator, a plurality of arc gaps formed by a plurality of axially alined, adjustable electricity conducting members operatively positioned in an electrical circuit, gravity actuated means for contiguously positioning said members when said circuit is broken and electrically actuated means for spacing said members when said circuit is closed.

5. In an oscillator, an electrode removably positioned in an imperfectly conducting fluid and a plurality of pairs of axially alined electrodes axially alined therewith and operatively positioned in an electrical circuit, and means operatively connected thereto for simultaneously and equally spacing the several pairs of electrodes.

6. In an oscillator, a stationary electricity conducting member and a plurality of axially alined, adjustable electricity conducting members axially alined therewith and operatively positioned in an electrical circuit, gravity actuated means for contiguously positioning said members when said circuit is broken and electrically actuated means for spacing said members when said circuit is closed.

7. In an oscillator, a plurality of arc gaps formed by a plurality of axially alined, adjustable electricity conducting members operatively positioned in an electrical circuit, manually operable means for placing and securing said members in said axial alinement, gravity actuated means for contiguously positioning said members when said circuit is broken, and electrically actuated means for spacing said members when said circuit is closed.

8. In an oscillator, a plurality of axially alined, adjustable electricity conducting members operatively positioned in an electrical circuit, and means for adjusting said members, said means comprising a solenoid having a divided core, each of the parts of said divided core being operatively connected to one of said members.

9. In an oscillator, a plurality of axially alined, adjustable electricity conducting members operatively positioned in an electrical circuit, and means for adjusting said members, said means comprising a solenoid having a divided core, each part of said core having a projecting arm adapted to slidably engage a supporting rod, a supporting rod attached to each of said electricity conducting members, and means whereby the movement of said core parts may be regulated.

10. In an oscillator, a plurality of axially alined, adjustable electricity conducting members operatively positioned in an electrical circuit, and means for adjusting said

members, said means comprising a solenoid having a divided core, each part of said core having a projecting arm adapted to slidably engage a supporting rod, a supporting rod in engagement with each of said projecting arms, an arm adjustably positioned on the lower end of each of said supporting rods and at right angles thereto, each of said last mentioned arms having one of said members removably attached thereto, and means whereby the movement of said core parts may be regulated.

11. In an oscillator, a plurality of arc gaps formed by a plurality of axially alined, interspaced electricity conducting members operatively positioned in an electrical oscillating circuit and immersed in an imperfectly conducting fluid, means for cooling said fluid, and means for simultaneously and equally spacing the several members and holding the same in said spaced relation.

12. In an oscillator, a vessel containing an imperfectly conducting fluid and provided with a means for cooling said fluid, a top for said vessel, a main supporting rod fixed in said top, a cored electrode adjustably mounted on the lower end of said main supporting rod, a plurality of adjustable supporting rods having squared upper ends slidably mounted in said top, a plurality of double electrodes adjustably mounted on said adjustable supporting rods, a solenoid positioned on said top, a divided core in said solenoid, a forked arm projecting from the lower end of each part of said divided core and engaging the squared end of one of said adjustable supporting rods, means for limiting the movement of each of said core parts, and a source of electrical supply connected to said solenoid and said double electrodes.

In testimony whereof I have hereunto affixed my signature in the presence of two subscribing witnesses.

CHAS. D. HERROLD.

Witnesses:
O. R. McREYNOLDS,
Mrs. J. E. BROWN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents Washington, D. C."