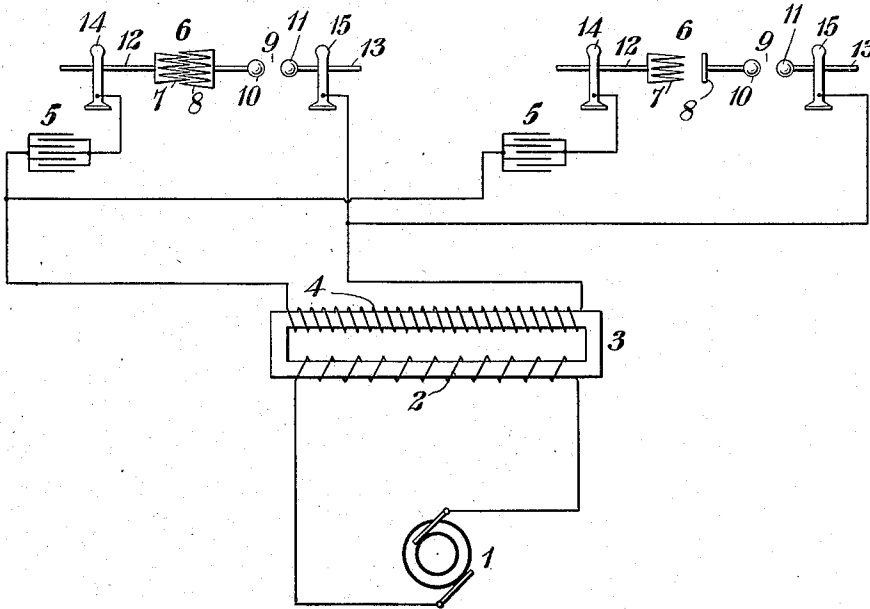


S. M. KINTNER.  
OZONE PRODUCER.  
APPLICATION FILED JUNE 28, 1905.

920,965.

Patented May 11, 1909.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

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## OZONE-PRODUCER.

No. 920,965.

Specification of Letters Patent.

Patented May 11, 1909.

Application filed June 28, 1905. Serial No. 267,467.

To all whom it may concern:

Be it known that I, SAMUEL M. KINTNER, a citizen of the United States, and a resident of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Ozone-Producers, of which the following is a specification.

My invention relates to means for producing electrical discharges, and particularly to means for producing such electrical discharges as will effect the production of ozone.

The object of my invention is to provide a novel combination and arrangement of circuits and devices whereby the character of electrical discharges may be greatly improved and the amount of ozone that is produced thereby may be increased over what it has been possible to produce heretofore with the same expenditure of energy.

Electrical discharges which occur respectively between pointed and blunt terminals differ both in character and result. If a comparatively moderate difference of potential exists between pointed terminals, a continuous, silent discharge will occur between them and produce ozone. A spark discharge occurs between blunt terminals when a sufficient difference of potential is applied thereto to cause rupture of the insulating medium in the gap and this difference of potential is ordinarily much larger than is required to cause a continuous, silent discharge between pointed terminals that are separated by some distance. Nitrogenous compounds are produced by spark discharges.

I have found, by experiment, that if a condenser, a gap having pointed terminals and a gap having blunt terminals are arranged in series circuit (which gaps I shall hereinafter term silent discharge gap and spark discharge gap, respectively), a more persistent and effective discharge will occur at the silent discharge gap and a larger amount of ozone will be produced thereby than would be the case if this arrangement were not employed. The amount of the continuous or silent discharge and its effectiveness as an ozone producer may be varied by adjusting the width of the spark discharge gap.

The silent discharge gap may be suitably inclosed, in order to provide for collection

and utilization of the ozone, and the spark discharge gap may be so located as to enable its ready adjustment and should preferably be removed or isolated from the other gap to prevent contamination of the ozone with the nitrogenous compounds that are produced by the spark discharge.

The single figure of the accompanying drawing illustrates the circuits diagrammatically as arranged in accordance with my invention.

Alternating current energy may be supplied from any suitable source, such as a generator 1, to the primary winding 2 of a voltage-raising transformer 3, and connected in series circuit with the secondary winding 4 are a condenser 5, a silent discharge gap 6 having pointed terminals 7 and 8, and a spark discharge gap 9 having spherical or blunt terminals 10 and 11, the gap 6 being located preferably between the condenser 5 and the spark discharge gap 9.

The widths of the gaps may be adjusted by sliding the rods 12 and 13 in their respective guide posts 14 and 15, or they may be adjusted in any other suitable manner.

Certain advantages may be derived from combination of devices and the arrangement of the circuits made in accordance with my invention which, so far as I am aware, cannot be derived from other combinations and arrangements, one in particular being the possibility of arranging several of the silent discharge or ozone-producing gaps 6 in parallel relation, the capacity of the condenser 5 being sufficient to permit passage of the total amount of current required by the several devices. This is especially desirable when several units or sets of apparatus are to be operated simultaneously.

The energy for the discharges may be derived from pulsating currents, or any suitable source of alternating current, and the condenser, the silent discharge gap and the spark discharge gap may be arranged in series circuit or in any other suitable relation than that shown, though, as before stated, I prefer to arrange them with the silent discharge gap between the condenser and the spark discharge gap. It will also readily be understood that the terminals of the gaps may assume other forms than those shown and described so long as the character of the discharge is not changed by altering the

form of the terminals. For instance, one of the terminals of the gap 6 may be a plate or a plane surface and the other terminal be pointed.

5 In the operation of my invention, the width of the spark discharge gap 9 is so adjusted that the sparks will occur between the terminals 10 and 11 in rapid succession, and the width of the silent discharge gap 6  
10 is then so adjusted that the maximum amount of continuous discharge shall occur between the points. With such an arrangement, I have found, by experiment, that if the amount of discharge at the gap 6 be  
15 judged from the glowing of the terminals in a dark room and from the amount of ozone produced, such discharges are greater in amount than I have been able to obtain without the employment of a spark discharge gap such as that at 9. While I am  
20 unable to offer a conclusive reason for this phenomenon, I believe that the discharges at the spark gap 9 cause disturbances or oscillations in the secondary circuit of the transformer of materially higher frequency  
25 of alternation than that of the current in the primary circuit. I believe also that these oscillations do not occur through the impedance of the transformer winding, but  
30 that the transformer acts as a condenser.

As before stated, the spark discharge gap may be so inclosed and located as to enable most economical collection and utilization of the ozone produced, and if it is desired  
35 to prevent contamination of the ozone, the two spark gaps should be sufficiently removed or isolated from each other to prevent the nitrogenous products of the spark discharge from mixing with the ozone and  
40 oxygen compound.

If the ozone be employed in the purification of water, any suitable means for bringing it into intimate contact with the water and its impurities, such as means for causing  
45 the ozone to bubble up through the water, may be employed.

I claim as my invention:

1. The combination of a source of alternating or pulsating current, a condenser, a  
50 single spark gap and a silent discharge gap connected in series relation.

2. The combination with a source of alternating or pulsating current, a condenser, a single spark discharge gap and a silent  
55 discharge gap all connected in series rela-

tion, of means for adjusting the widths of the discharge gaps.

3. The combination of a source of alternating or pulsating current, a condenser, a discharge gap having one or more pointed  
60 terminals, and a single discharge gap having blunt terminals all arranged in series relation.

4. The combination with a source of alternating or pulsating current, a condenser, a  
65 discharge gap having one or more pointed terminals, and a discharge gap having blunt terminals all arranged in series circuit relation, of means for adjusting the widths of  
70 the gaps.

5. The combination with a source of alternating or pulsating current, of a circuit supplied from said source having a condenser, a discharge gap provided with  
75 pointed terminals, and a discharge gap provided with blunt terminals.

6. The combination of a transformer winding, a condenser, a silent discharge gap and a spark discharge gap all arranged  
80 in series relation.

7. The combination of a transformer winding, a silent discharge gap, a spark discharge gap, and a condenser all arranged in series relation, the condenser being of  
85 sufficient capacity to prevent spark discharges at the silent discharge gap.

8. The combination of a source of fluctuating current, a condenser, a single spark gap, and a silent discharge gap connected  
90 in series relation, the silent discharge gap being located in the circuit between the condenser and the spark gap.

9. The combination of a source of fluctuating current, a condenser, a single spark gap, and an ozone producing device all arranged  
95 in series relation.

10. The combination of a source of fluctuating current, a condenser, a single spark gap, and an ozone producing device all arranged in series relation, the ozone producing  
100 device being located in the circuit between the condenser and the spark gap.

In testimony whereof, I have hereunto subscribed my name this 17th day of June 1905.

SAMUEL M. KINTNER.

Witnesses:

OTO S. SCHAIRER,  
BIRNEY HINES.