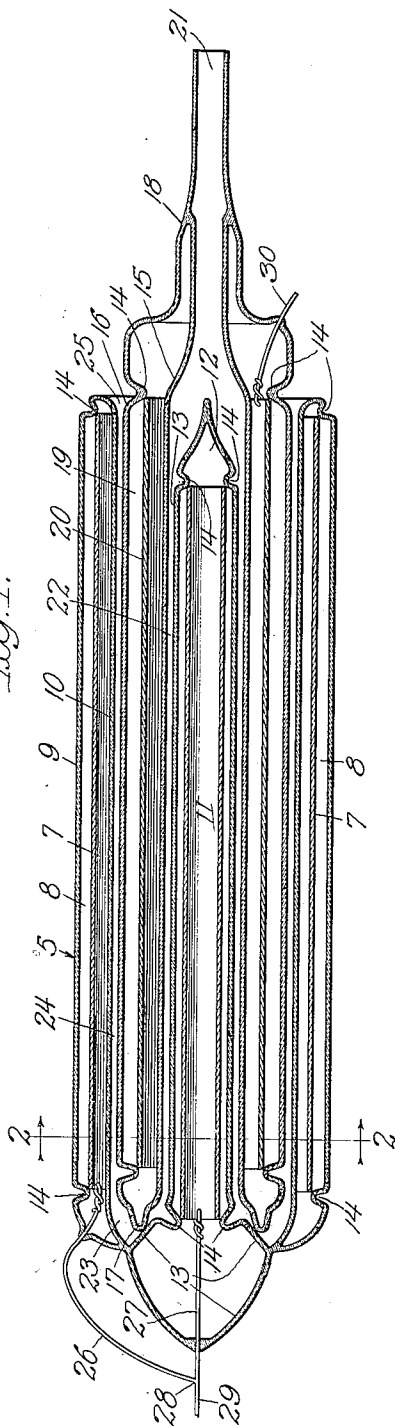


1,358,443.

Fig. 1.



4. 627

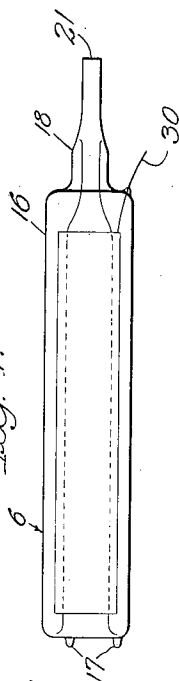


Fig. 3.

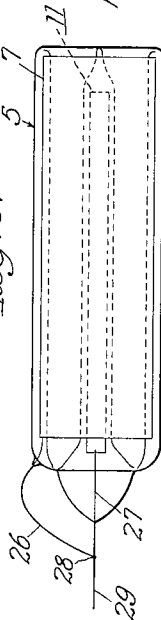
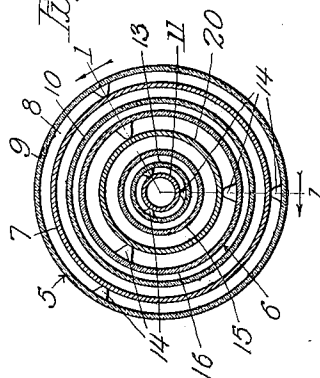


Fig. 2



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# UNITED STATES PATENT OFFICE.

SIEGFRIED HELD, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO ADOLPH KAESTNER, OF CHICAGO, ILLINOIS.

## OZONE-GENERATOR.

1,358,443.

Specification of Letters Patent.

Patented Nov. 9, 1920.

Application filed April 13, 1918. Serial No. 228,326.

*To all whom it may concern:*

Be it known that I, SIEGFRIED HELD, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Ozone-Generators, of which the following is a specification.

My invention relates to improvements in ozone generators.

One of the objects of my invention is to provide an ozone generator in which all of the electrodes of the device are suspended within vacuum chambers, substantially out of contact with the walls, with the smallest practicable surface contact with the surrounding di-electric walls constituting the containers for said electrodes.

By this means the electrodes are more completely isolated from extraneous influences and hence the device as a whole, is more efficient.

Another object of my invention is to make the generator in two axially telescoping separable parts so that the exterior surfaces of the walls, bounding the air passages through the device, may be accessible for cleaning, by separating the parts and removing therefrom the deposited matter that was held in mechanical suspension in the air that is passed through the device, and which by the bombarding effect, produced by the high potential field through which the air is passed, is caused to adhere tenaciously to the outside surfaces of the casings, or tubes.

Still another object of my invention is to provide a plurality of electrodes in one or both of the elements of the device and confine said electrodes in separable so called vacuum chambers, within which the air has been sufficiently attenuated for the purpose, and to provide, between said electrodes, suitable air passages, so that the air may pass more than once through an axial path provided in said device.

Specifically, the embodiment of the ozone generator illustrated consists in inner and outer, spaced-apart, cylindrical electrodes, suspended concentrically in separate chambers, within casings composed of di-electric material, such as glass, or the like, constituting one part or element of the device, and another intermediate cylindrical electrode suspended in a similar chamber of another casing, constituting the other element of the

device, insertable within the first mentioned element, when ready for operative use.

In Figure 1 I have shown a longitudinal section of the device, taken on line 1—1 of Fig. 2, with the parts in the positions that they occupy when the device is ready for use.

Fig. 2 is a transverse section taken on line 2—2 of Fig. 1.

Fig. 3 is an outline of one of the elements of the device containing two electrodes; and

Fig. 4 is the other element of the device, containing in this example, one electrode, which is insertible within the element shown in Fig. 3, and which occupies the position shown in Fig. 1, when the generator is ready for operation.

The outer element 5 and the inner separable element 6, constitute, when assembled, a completed device. The outer electrode 7 is contained within an exhausted casing 8 having an outer wall 9 and a concentric inner wall 10. A much smaller metal tube or electrode 11, consisting of aluminum, or the like, is contained within a vacuum chamber 12 provided with a casing wall 13. These tubes constituting the electrodes of element 5, are suspended in the glass tubes at their extreme ends by indentations 14. The indentations support the outer corner edges of the metal tubes and suspend them within the respective di-electric tubes or casings with a minimum surface contact. The element 6 of opposite polarity consists of the inner tube 15 and the outer tube 16 connected together at their ends, as at 17 and 18, respectively, to form an annular vacuum chamber 19, when the tubes have been properly exhausted. Suspended within the tube is a concentric electrode or tube 20, of aluminum or the like, supported by the indents 14 in a similar manner by which the tubes heretofore referred to are supported. The end 17 of the inner element rests upon an incline in the wall 13 that surrounds the inner tube 11 for the purpose of supporting the inner element concentrically within the outer element. An air passage is provided between the inner and outer elements as follows: An axial opening 21 provides means for the entrance of the air to be ozonized, which air passes through the concentric chamber or opening 22, between the inner tube of the outer element and the tube 13 of the inner element; the passage opens around and through the

chamber 23 between ends of the elements and then through a concentric chamber 24. The air is finally discharged through the concentric opening 25, between the two elements.

The electrodes 7 and 11 of the outer element are connected together by wires 26 and 27, respectively, as at 28, to the wire 29, hence these electrodes are always of the same polarity. The electrode 20 of the inner element 6 is connected by a wire 30 to the opposite terminal of a source of electric current supply to which the generator is to be connected. The wires 27 and 30 are sealed in the respective glass tubes, as clearly shown.

The operation of the device is well known to persons skilled in the art, and will need no further explanation here. The source of current supply is connected to the wires 29 and 30 and the silent discharge takes place between the outer surface of the tube 11 and the inner surface of the tube 20 and between the inner surface of the tube 7 and the outer surface of the tube 20. In the meantime the air passes between the surfaces in which the electric field is thus produced and the constituents of the air are changed so as to produce ozone. The air first passes into the opening 21 toward the left end of the device and reverses, as at 23, and passes out through the openings 25 in the opposite direction, thus providing a long path through a device of relatively small dimension.

During the operation of the device the dirt, or other material held in mechanical suspension in the air, is deposited upon the outside glass surfaces through which the electrical discharge takes place, but by separating the elements the surfaces, that in other devices of the same character are inaccessible, are readily available for cleaning and thereby their high efficiency is maintained.

While I have herein shown a single embodiment of my invention, for the purpose of clear disclosure, it is manifest that many changes may be made in the general configuration and disposition of the parts, within the scope of the appended claims.

Having described my invention, what I claim is:—

1. An ozone generator comprising spaced-apart, di-electric, hollow elements with air space between them, one of said elements providing a partially exhausted chamber, an electrode within said chamber, and another electrode carried by the other element, one said element being wholly within the other and said elements being separable to render adjacent surfaces available for cleaning.

2. A two-part ozone generator comprising an inner, hollow element, providing closed

walls of di-electric material inclosing a chamber from which the air has been partially exhausted; an electrode therein; an outer element, of similar character, within which the inner element is wholly contained; an electrode in the outer element and terminal wires sealed in the walls of the respective elements and connected to the respective electrodes, said inner element and electrode being separable from the surrounding element and electrode.

3. An ozone generator comprising separable elements, one element providing a double-walled spaced-apart cylinder of di-electric material and a similar single wall cylinder, each inclosing a chamber from which air has been partially exhausted; an electrode in each said chamber; the other element comprising a similar double walled cylinder inclosing a similar chamber; an electrode in said chamber, the latter element insertible between the inner and the outer cylinders of the first mentioned element, providing a free air space between said cylinders.

4. An ozone generator comprising separable spaced apart cylindrical bodies, one insertible wholly within the other, each cylinder inclosing a partially exhausted chamber and an electrode in each chamber.

5. An ozone generator comprising three axially disposed concentric cylindrical casings spaced apart to provide an air space therebetween; each casing inclosing a partially exhausted chamber and an electrode in each chamber.

6. An ozone generator comprising three axially disposed cylindrical glass casings, spaced apart to provide air spaces therebetween, said casings open at opposite ends, each casing inclosing a partially exhausted chamber and an electrode in each chamber whereby to provide a continuous air path back and forth through the device between the respective electrodes.

7. In a device of the class described a double-walled di-electric cylindrical casing providing a sealed chamber and a cylindrical electrode in said chamber concentrically supported therein; a support for holding said electrode out of contact with either wall and also prevent its axial movement.

8. In a device of the class described a double-walled, di-electric, cylindrical casing providing a sealed chamber and a cylindrical electrode in said casing concentrically supported therein out of contact with either wall and indents made in the wall of the casing at each end of the electrode to support the latter and to prevent its axial movement therein.

In testimony whereof I hereunto set my hand.

SIEGFRIED HELD.