C. G. ARMSTRONG.

APPARATUS FOR PRODUCING OZONE.

APPLICATION FILED MAY 15, 1909.

991,767.

Patented May 9, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

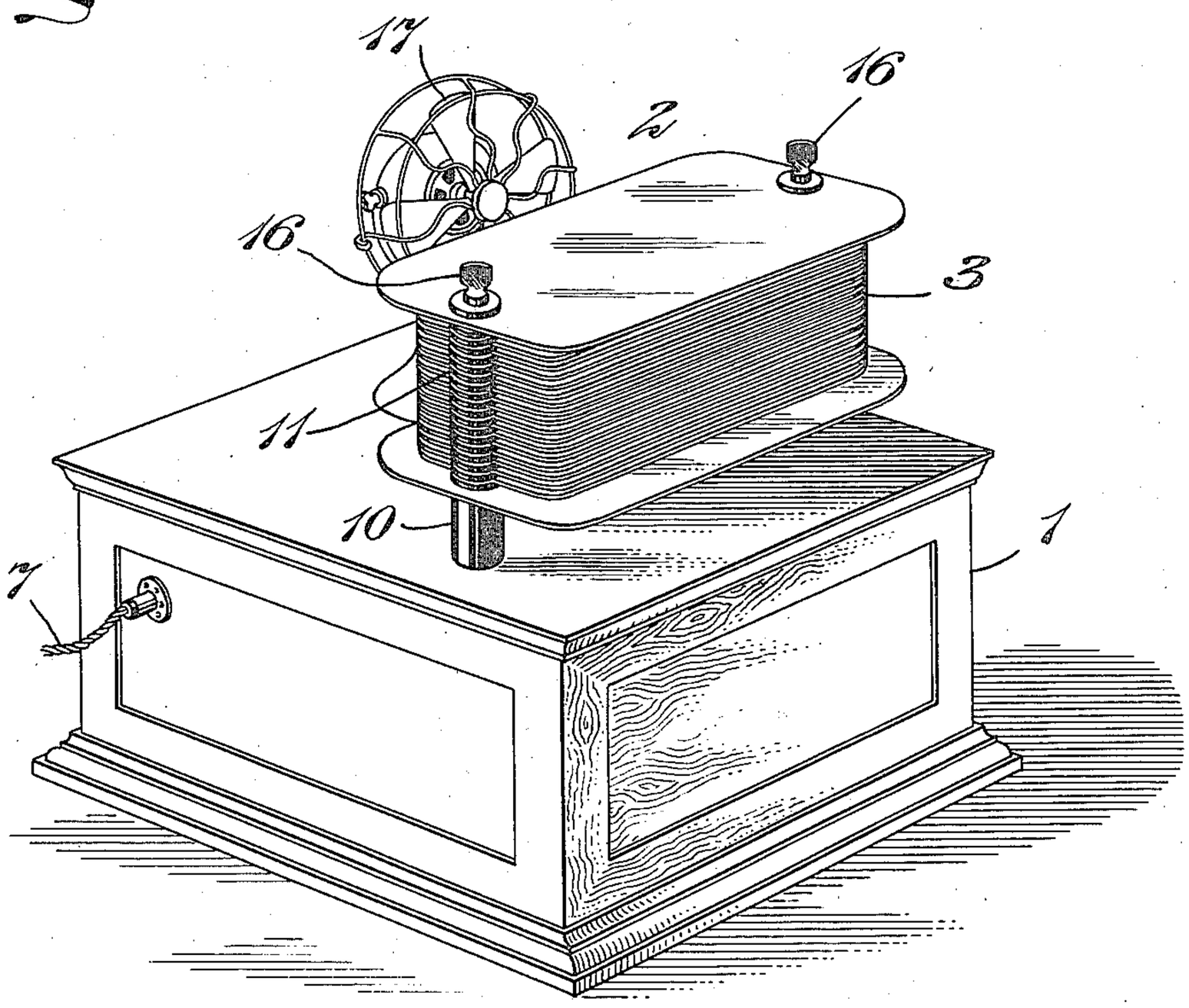


Fig. 3.

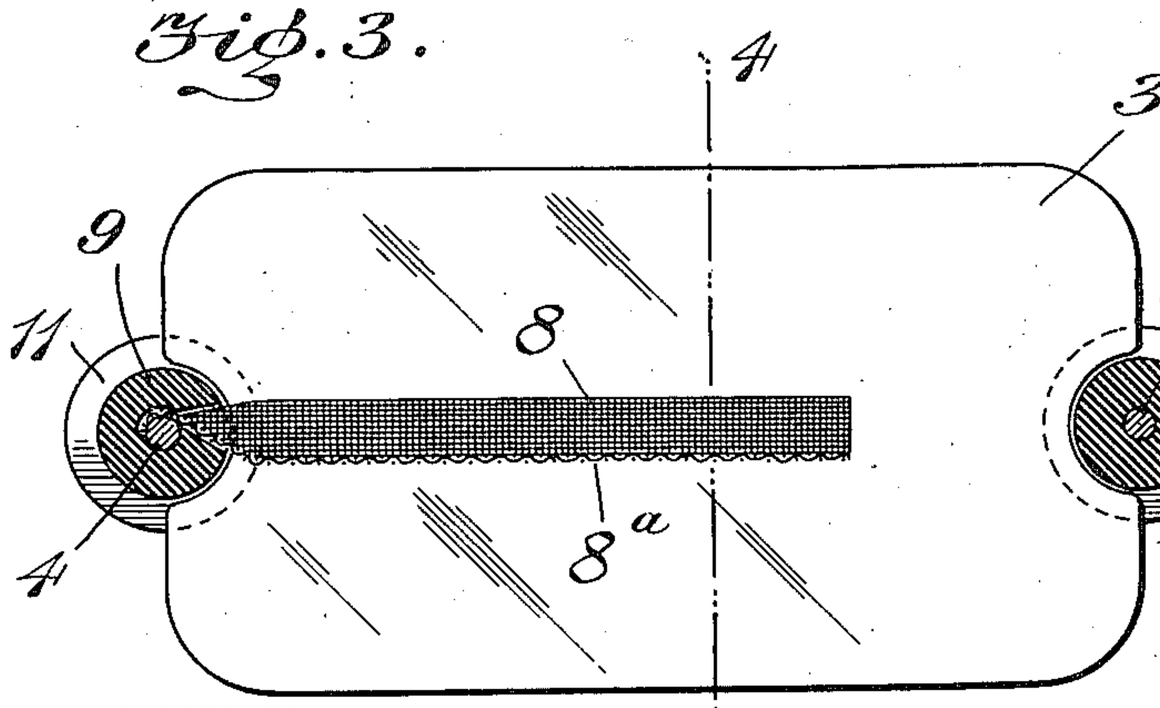
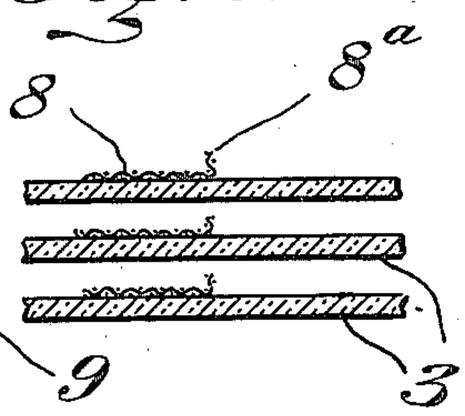


Fig. 4.



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2 SHEETS—SHEET 2.

Fig. 2.

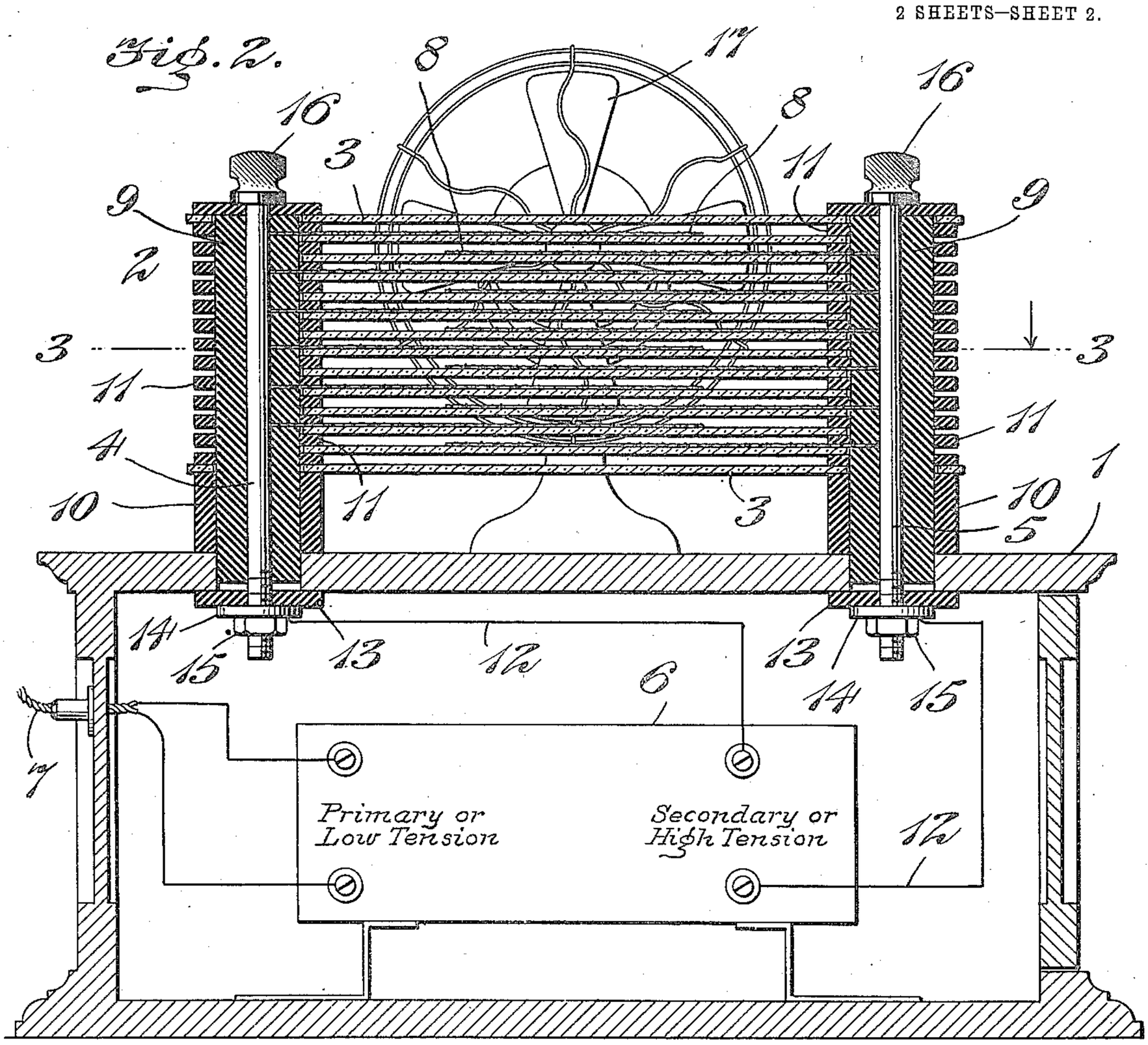
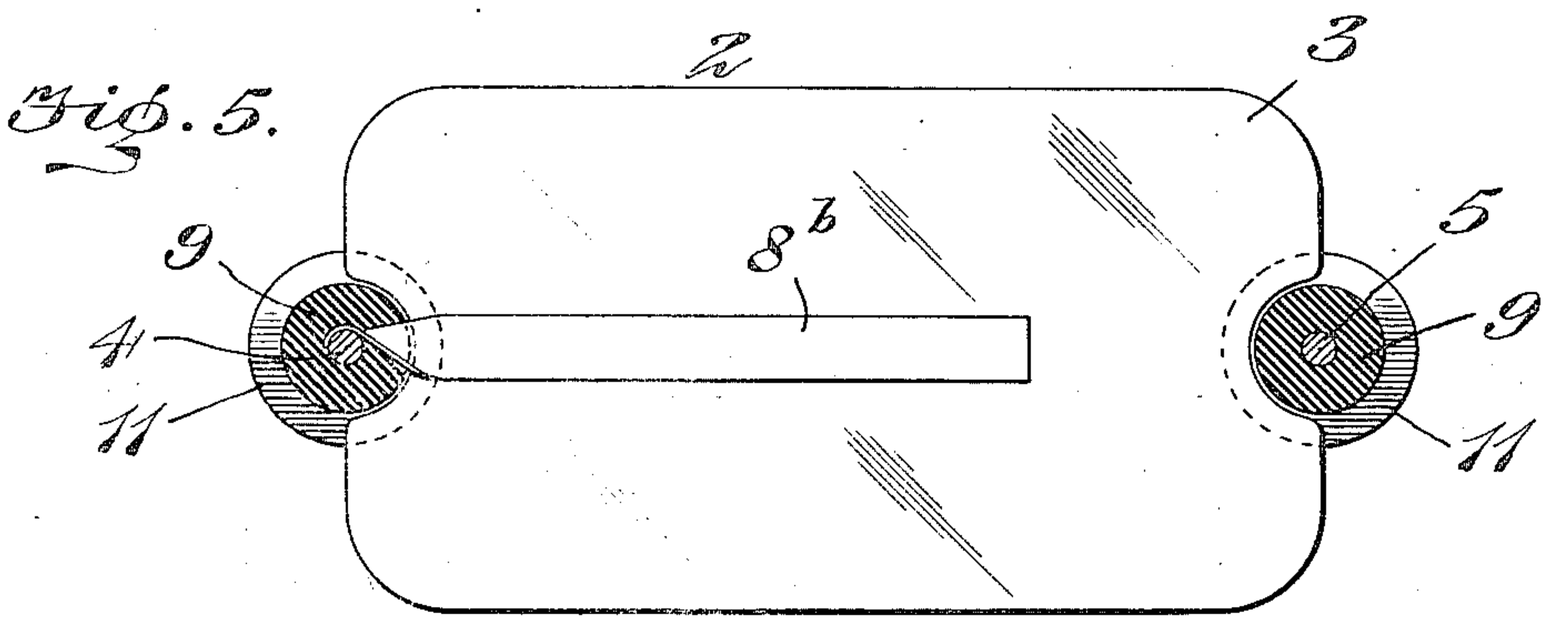


Fig. 5.



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CHARLES G. ARMSTRONG, OF ORANGE, NEW JERSEY.

APPARATUS FOR PRODUCING OZONE.

991,767. Specification of Letters Patent. Patented May 9, 1911.

Application filed May 15, 1909. Serial No. 496,310.

To all whom it may concern:

Be it known that I, CHARLES G. ARMSTRONG, a citizen of the United States, and a resident of the city of Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Apparatus for Producing Ozone, of which the following is a full, clear, and exact specification, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in apparatus for producing ozone by the electrification of the atmosphere.

The principal objects of my invention are, to provide a simple and compact apparatus, of high efficiency, and which will be capable of producing a pure quality of ozone from the atmosphere, under electrostatic stress, so as to be available as an air-purifier, and for other purposes. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a perspective view of the apparatus; Fig. 2 is a front vertical section; Fig. 3 is a plan view on the line 3—3 of Fig. 2; Fig. 4 is a cross section on the line 4—4 of Fig. 3; Fig. 5 shows a modified form of the conductor shown in Figs. 3 and 4.

Similar reference letters and figures refer to similar parts throughout the several views.

1 indicates a case, upon which is mounted an electrical condenser 2.

3 indicates sheets of glass, or other solid dielectrics, preferably of a general rectangular form, which may be provided with rounded corners, as shown in Figs. 1 and 3. As indicated in Figs. 1 and 2, the glass plates 3 are slightly separated from each other.

4 and 5 are electrodes connected with a transformer 6, which I have placed on the inside of the case 1, the transformer being shown diagrammatically in Fig. 2. Connected with the transformer are the main wires 7.

Upon each of the glass plates 3, save the top and bottom plates, is a conducting material 8, extending from one of the electrodes approximately two-thirds of the length of the plate in the direction of the opposite electrode. These conductors, which are preferably made of copper gauze and preferably with one edge 8^a (acting as a discharging edge) turned up at right angles to the glass plates, as shown in Figs. 3 and 4, are in the same vertical plane, and are connected alternately to the two electrodes, so that the topmost conductor is connected to the electrode opposite that to which the one underneath is connected and so on. The conductors, however, may be constructed of tin-foil, as shown in Fig. 5, or of other suitable material. Surrounding the electrodes 4 and 5 is an insulating material, preferably of rubber, as at 9.

10 is a ring of rubber, or other insulating material, upon which the glass plates rest.

11 are washers of rubber or other insulating material, interposed between the ends of the glass plates and surrounding the electrodes.

12 indicates the circuit between the transformer 6 and the electrodes 4 and 5.

13 indicates washers of rubber, or other insulating material.

14 is a metal washer, between which and the nut 15 the wires of the circuit 12 are fastened by means of the thumb-screw 16, which latter is constructed of insulating material, preferably of rubber.

17 indicates an electric fan juxtaposed to the glass plates so that the atmosphere will be constantly circulated while the fan is in motion from the outside through the spaces between the glass plates 3.

It is important in arranging the conductors that they should not be extended from their respective electrodes far enough to set up short-circuiting with the opposite electrodes. It is also important to have the insulating plates of such breadth that the electricity of one polarity will not readily creep around the edges of the plates and unite with the electricity of the opposite polarity.

The thickness of the insulating plates, as well as the air-spaces between them, will be governed by the voltage of the current employed. Low voltage will require smaller air-spaces, and a thinner glass than a high voltage. These elements can be readily adjusted, and should be arranged so that some electricity will find a passage from the conductors of one polarity to the conductors of opposite polarity through the glass plates. It is important, however, to avoid the production of a sharp reddish pointed discharge or spark, as this produces nitrous gas, or an inferior quality of ozone. The resistance of the dielectrics should, therefore be sufficient

to prevent this, and to secure, instead, a subdued or bluish fluorescent sparking or discharge. I prefer to use glass plates approximately one-twentieth of an inch in thickness, with one quarter of an inch air-space between them, and to have an alternating current from the transformer of about 10,000 volts.

It is a well known fact that to the state of strain of the atmosphere preceding an electrical discharge, as well as to the discharge itself, is due the production of ozone. It has also been found that when a portion of the atmospheric oxygen has been changed to ozone, each additional discharge, besides producing more ozone, will tend to damage, if not totally destroy, some of that previously produced. Accordingly it is my object to avoid subjecting the atmosphere on its passage through the condenser to more than one discharge, and to limit the length of the path of the air through the field of electrostatic stress, so that the ozone, once produced, will be wafted away before it can be damaged by further electrostatic action. This I have provided for in a most effectual manner in the condenser constructed and arranged as above set forth, so as to form a plurality of relatively short, independent passages in which the moving air is subjected to the electrostatic stress, and wherein the sparking is confined to an extremely narrow zone.

The operation of my invention is as follows: The atmosphere is forced by the electric fan 17 into the spaces between the glass plates, the electric current from the transformer 6 enters the electrodes 4 and 5 and passes over the conducting strips on the glass plates 8. The charges of opposite polarity on the adjacent conducting strips set up both in the glass and the intervening air, the characteristic stresses of the electrostatic field, and the passage of the atmospheric oxygen through this field results in the production of ozone.

While I have shown and described one embodiment of my invention, I wish it to be understood that variation may be made in the form, proportions and materials used in the construction of the apparatus and of the parts composing the same, without departing from the spirit of the invention, or the scope thereof, as defined by the appended claims.

Breaking of the plates due to too high a voltage, can easily be avoided. Should, however, any of the plates become damaged, other plates can be readily substituted by unfastening the thumb-screw 16 and lifting off the plates.

Having thus described my invention, what I claim is:

1. In a device of the character described, the combination of relatively narrow positive and negative conductors, a dielectric interposed between each positive and negative conductor, means for forcing air across the dielectric from side to side, said conductors being arranged transversely across the air current, whereby the air is subjected to but one electrostatic action.

2. In a device of the class described, the combination of a plurality of relatively narrow positive and negative conductors, a plurality of dielectrics interposed one between each two adjacent conductors, said dielectrics and conductors being spaced apart to form a plurality of independent air passages, means for forcing a current of air transversely across said conductors, and means for supplying an electric current to said conductors.

3. In a device of the class described, the combination of a plurality of relatively narrow positive and negative conductors, a plurality of dielectrics interposed one between each two adjoining conductors, said dielectrics and conductors being spaced apart to form a plurality of independent air passages, means for forcing a current of air transversely across said conductors, and means for supplying an electric current to said conductors, whereby the air in passing through said air passages is subjected to but one electrostatic action.

4. In a device of the class described, a condenser having in combination a plurality of relatively narrow positive and negative conductors, a plurality of dielectrics interposed one between each two adjacent conductors, said dielectrics and conductors being spaced apart to form a plurality of independent air passages, means for forcing a current of air transversely across said conductors, and means for supplying an electric current to said conductors, whereby the air passing therethrough is subjected to but one silent discharge.

5. In a device of the class described, a condenser having in combination a plurality of relatively narrow positive and negative conductors, a plurality of solid dielectrics interposed one between each two adjacent conductors, said dielectrics and conductors being spaced apart to form a plurality of independent air passages, means for supplying an electric current to said conductors, and means for forcing air through the spaces between the dielectric plates from one side thereof to the other, whereby the air will cross said conductors transversely and is subjected to but one electrostatic action.

6. In apparatus for producing ozone, the combination of a condenser, comprising positive and negative terminals, a series of relatively narrow conductors extending from the positive terminal, a series of relatively narrow conductors extending from the negative terminal between the positive conductors in alternate relation therewith, and a series of dielectric plates arranged one between each

two adjacent conductors, said plates being separated to provide air spaces therebetween, and means for supplying electricity to the condenser terminals to charge the condenser.

7. In apparatus for producing ozone, the combination of a condenser comprising positive and negative terminals, a series of relatively narrow conductors extending from the positive terminal, a series of relatively narrow conductors extending from the negative terminal between the positive conductors in alternate relation therewith, and a series of dielectric plates arranged one between each two adjacent conductors, said plates being separated to provide air spaces therebetween, means for supplying electricity to the condenser terminals to charge the condenser, and means for forcing air through the spaces between the dielectric plates and transversely across the said conductors.

8. In apparatus for producing ozone, the combination of a condenser comprising positive and negative terminals, a series of relatively narrow conductors extending from the positive terminal, a series of relatively narrow conductors extending from the negative terminal between the positive conductors in alternate relation therewith, a series of dielectric plates arranged one between each two adjacent conductors, said plates being separated to provide air spaces therebetween, means for supplying high tension alternating electric current to the condenser terminals to charge the condenser, and means for forcing air through the air spaces transversely across said conductors.

9. In a device of the character described, the combination of relatively narrow positive and negative conductors, a dielectric interposed between each positive and negative conductor, said dielectric having sufficient resistance to secure a silent discharge between said conductors, means for forcing air across the dielectric from side to side, said conductors being arranged transversely across the air current, whereby the air is subjected to but one silent discharge.

10. In a device of the class described, the combination of a plurality of relatively narrow positive and negative conductors, a plurality of dielectrics interposed one between each two adjacent conductors, said dielectrics and conductors being spaced apart to form a plurality of independent air passages, said dielectrics having sufficient resistance to secure a single silent discharge in each of said air spaces, and means for supplying an electric current to said conductors.

11. In a device of the class described, the combination of a plurality of relatively narrow positive and negative conductors, a plurality of dielectrics interposed one between each two adjacent conductors, said dielectrics and conductors being spaced apart to form a plurality of independent air passages, said dielectrics having sufficient resistance to secure a single silent discharge in each of said air spaces, means for supplying an electric current to said conductors, and means for forcing a current of air transversely across said conductors.

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Witnesses:
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