

**1,056,789.**

3 SHEETS—SHEET 1.

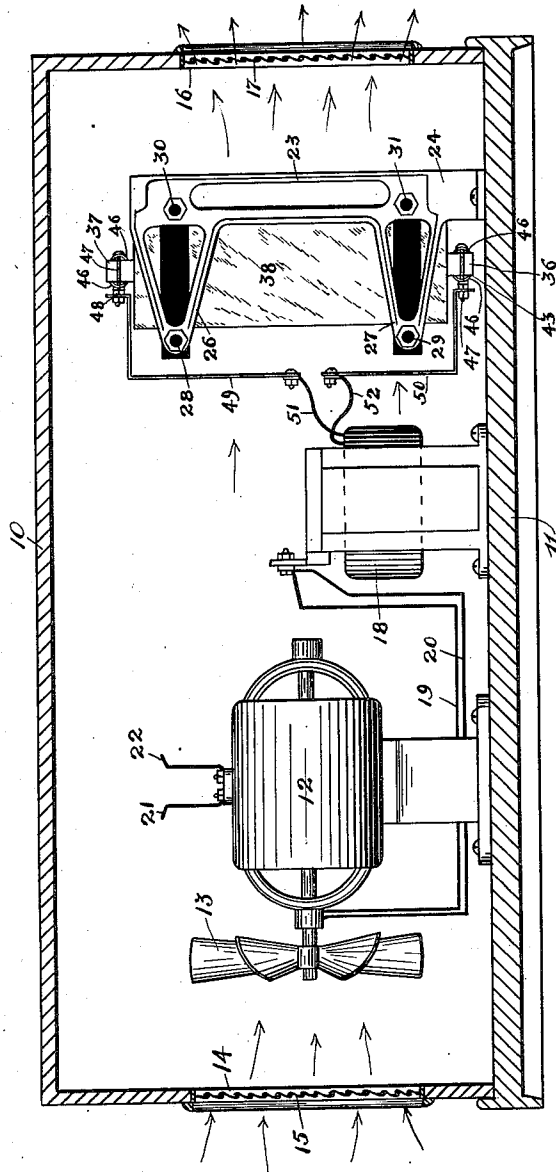


Fig. 1.

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 APPARATUS FOR PRODUCING OZONE.  
 APPLICATION FILED AUG. 10, 1911.

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Patented Mar. 25, 1913.

3 SHEETS—SHEET 2.

Fig. 2.

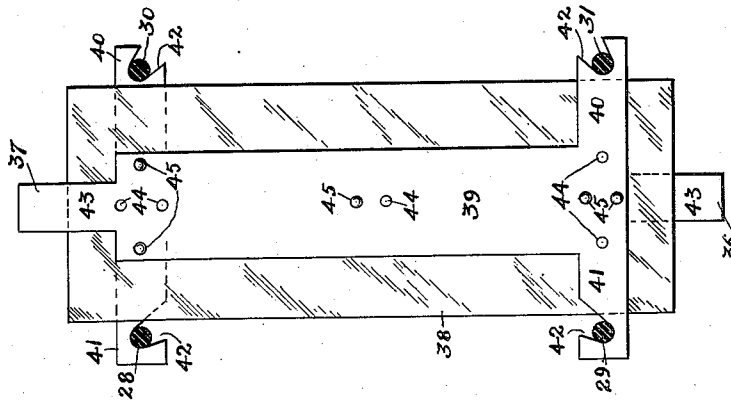
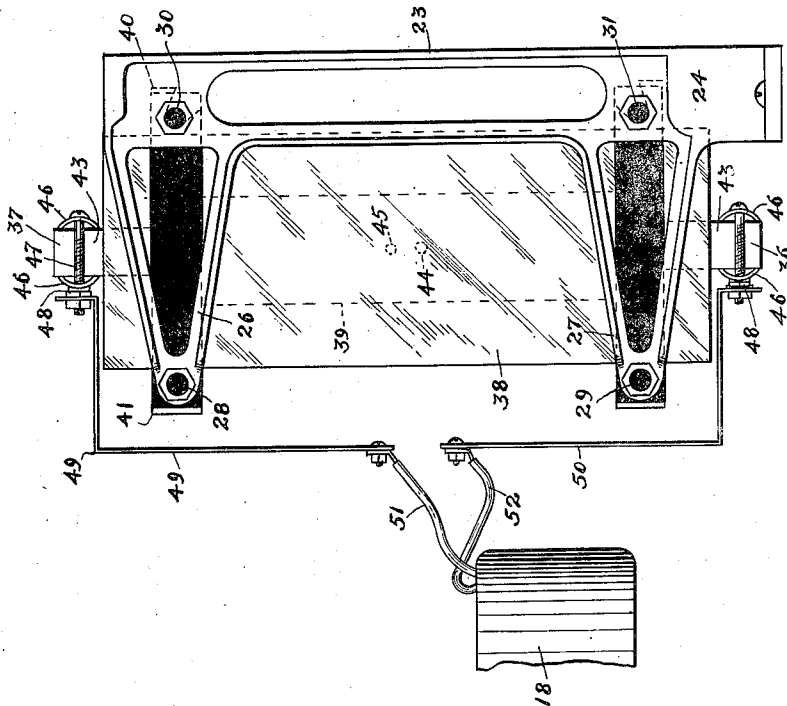


Fig. 2.



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3 SHEETS-SHEET 3.

Fig. 6

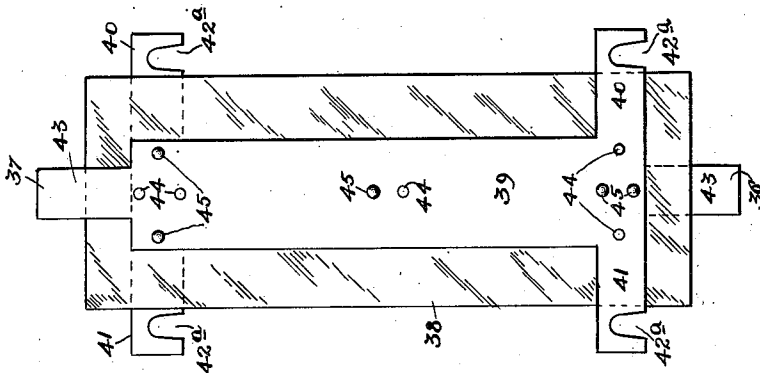


Fig. 5.

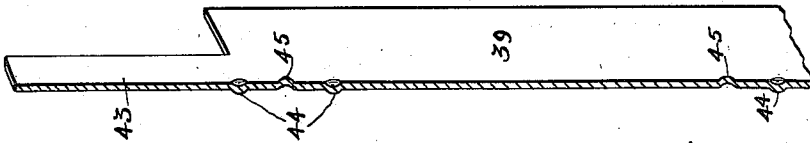
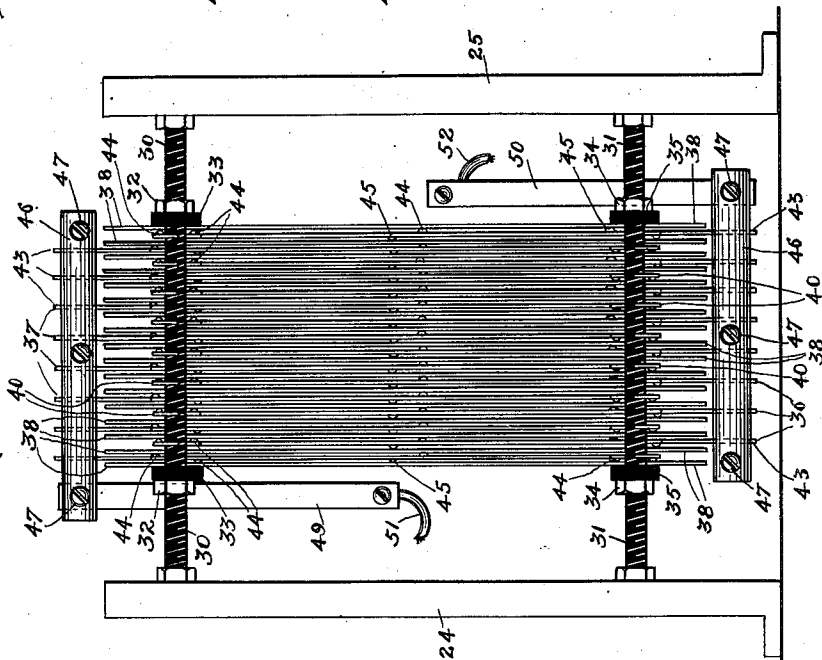


Fig. 4.



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# UNITED STATES PATENT OFFICE.

SIEGFRIED HELD, OF CHICAGO, ILLINOIS, ASSIGNOR TO NATIONAL AIR FILTER COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ARIZONA.

## APPARATUS FOR PRODUCING OZONE.

1,056,789.

Specification of Letters Patent.

Patented Mar. 25, 1913.

Application filed August 10, 1911. Serial No. 643,321.

*To all whom it may concern:*

Be it known that I, SIEGFRIED HELD, a subject of the Emperor of Austria-Hungary, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Apparatus for Producing Ozone, of which the following is a specification.

This invention relates to improvements in an apparatus for producing ozone, and particularly to the electrodes thereof, and it consists in certain peculiarities of the construction, novel arrangement and operation of the various parts thereof, as will be hereinafter more fully set forth and specifically claimed.

The principal object of the invention is to provide an apparatus for producing ozone, or ozonizing air by means of the discharge of electric current of high potential, which shall be simple and inexpensive in construction, strong, durable, compact in form, efficient in operation, and so made that it may be, if desired, readily connected to the ordinary 110 volt electric light circuit, and thus be conveniently used, or to any suitable source of electric supply for furnishing current of the required tension to the electrodes.

Another object is to so construct, arrange, and support the electrodes used to produce the electrical discharges, and their connecting parts, that they can be readily placed in operative position in the apparatus or easily removed therefrom for the purpose of permitting them to be cleaned.

A further object is to so support and arrange the electrodes that their number may be varied in a given sized apparatus to produce the result required, thereby varying the capacity of the machine by simply increasing or diminishing the number of electrodes.

Still another object is to provide means whereby the various elements of the apparatus will be compactly incased in their operative positions for shipment and use, without danger of impairment by accidental disconnection of the parts, particularly of the conductors leading from the transformer to the electrodes, and so that the machine can be electrically connected for use by persons who are not skilled electricians.

Other objects and advantages of the invention will be disclosed in the subjoined description and explanation.

As the invention resides mainly in the construction, arrangement, and mounting or support of the electrodes and their connecting parts, I have shown said parts only in detail, and will hereinafter particularly describe the same, referring to the other parts of the apparatus in a general way only, it being deemed unnecessary to either show or describe the last mentioned parts in detail, as they may be of the ordinary or any preferred construction and their operation is well known.

In order to enable others skilled in the art to which the invention pertains, to make and use the same I will now proceed to describe it referring to the accompanying drawings in which—

Figure 1, is a view partly in section and partly in elevation of an apparatus for producing ozone embodying the invention. Fig. 2, is a detached side view of the supporting frame for the electrodes, showing the latter mounted thereon and in electrical connection with the transformer, a portion of which is shown. Fig. 3, is a side view of a pair of the electrodes showing them separated by a piece of glass and illustrating the manner of holding the electrodes at slight distances from the pieces of glass, yet in parallelism therewith. Fig. 4, is a view of the supporting frame for the electrodes looking from one end thereof, and showing the electrodes mounted thereon. Fig. 5, is a fragmental perspective view of a portion of one of the electrodes showing the means employed for spacing the same from the pieces of glass which are interposed between the electrodes, and Fig. 6, is a view in side elevation of a pair of electrodes illustrating a modification in their construction.

Like numerals of reference refer to corresponding parts throughout the different views of the drawings.

The reference numeral 10, designates the casing of the apparatus, which casing may be made of any suitable size, form and material, but preferably of wood, and rectangular in shape as shown. This casing is provided with a base 11, on which is mounted near one of its ends an electric motor 12, or rotary converter, as the case may be, of the ordinary or any preferred construction, which drives a fan 13, mounted on the shaft

of the motor and inwardly from an opening 14, in one end of the casing which opening is provided with a screen 15, used to prevent access to the fan and to screen the air as it passes through said opening. The opposite end of the casing 10, is also provided with an opening 16, having a screen 17, there across for the purpose of guarding or protecting the interior mechanism of the apparatus, as well as to further screen the air as it passes through said opening. Mounted on the base 11, of the casing at about its middle is a transformer 18, of the ordinary or any preferred construction, which is electrically connected to the motor 12, in the usual manner by means of conductors 19, and 20, the shaft of which motor may be provided with an interrupter of the ordinary kind, not shown.

Leading from a suitable source of electrical supply, not shown, and through suitable openings in the casing, which openings are also not shown, and electrically connected to the motor in the usual manner are conductors 21, and 22, which supply the apparatus with electrical energy.

Mounted on the base 11, near one end thereof, which will be termed the discharging end, is the supporting frame for the electrodes, which frame is designated as a whole, by the reference numeral 23, and includes a pair of uprights 24, and 25, which are firmly secured at their lower ends to the base of the casing. Each of the uprights 24, and 25, of the electrode supporting frame is provided with upper and lower brackets or arms 26, and 27, respectively, which brackets are extended horizontally from said uprights and longitudinally with respect to the casing, so that the arms on one of said uprights will be in parallelism with the arms on the other upright, and a pair of said arms will be located near each side of the casing. Connecting the arms 26, is a horizontally disposed screw-threaded rod 28, and connecting the arms 27, is a similar rod 29, which rods are preferably made of fiber. Transversely uniting the uprights 24, and 25, are screw threaded rods 30, and 31, which are also preferably made of fiber and are located so that the rod 30, will lie in a plane with the rod 28, while the rod 31, will lie in a plane with the rod 29. Movably mounted on the rods 28, and 30, and adjustably held thereon by means of nuts 32, are a pair of bars 33, which are preferably made of fiber or other non electric conducting material. Movably mounted and adjustably held on the rods 29, and 31, by means of nuts 34, on said rods are a pair of bars 35, which are also made of insulating material.

Located between the bars 33, on the upper rods of the supporting frame for the electrodes, and between the bars 35, on the

lower rods of said frame are a series of electrodes and a number of pieces of glass which are interposed between said electrodes, the whole being pressed toward each other and held in spaced relation to one another by means of the bars 33, and 35, which can be adjusted on their respective rods by means of the nuts 32, and 34, on said rods and by means of projections formed on the electrodes as will be presently explained. The said electrodes are all of the same construction, but as one group thereof is in electric connection with one pole and the other is in connection with the other pole, said groups will be designated by different characters, for instance, the reference numeral 36, designates the electrodes of one of the groups and the numeral 37, the electrodes of the other group, while the reference numeral 38, designates the pieces or plates of glass which are interposed between the electrodes and are located on the outside of the outermost electrodes. As is clearly shown, in Fig. 3, of the drawings, each of the electrodes consists of a main or body portion 39, having at one of its ends arms 40, and 41, which are disposed in opposite directions and at substantially right angles to the body of the electrode. Each of the arms 40, and 41, is provided with an open slot or recess 42, to receive a pair of the rods of the supporting frame. These slots or recesses are preferably inclined in the same direction as is clearly shown in Fig. 3, of the drawing, to facilitate the positioning of the electrodes. At its opposite end from the arms 40 and 41, the body 39, is provided with a longitudinal extension 43, which is preferably reduced as shown, and said extensions project beyond the ends of the glass pieces 38, or plates for the purpose to be presently explained. Each of the electrodes, which are preferably made of aluminum, is provided with a series of projections 44, and 45, which are formed by indenting the electrodes on opposite sides, thus producing the projections 44, and 45, which are disposed on opposite sides of the electrodes, as will be clearly understood by reference to Figs. 3, 4, and 5, of the drawings, so that when the electrodes and pieces of glass are placed in their operative positions on the supporting frame, said projections will rest against the surfaces of the glass pieces and hold them at a slight distance from the electrodes so as to permit the passage of air between the glass plates and electrode. The projections 44, and 45, are preferably arranged in groups, one group near each of the ends of the electrodes and the other near the middle thereof as is clearly shown in Figs. 3, and 6, of the drawings. By forming the electrodes with indentations on opposite surfaces thereof and with corresponding projections, it is evident that as these

projections are integral with the electrodes they are not liable to be misplaced or lost and besides they can and should be made of uniform size so that uniform spaces between the glass pieces and electrodes will be provided when said members are in their operative positions. As before stated, the extensions 43, of the electrodes project beyond the ends of the glass plates 28, thus affording portions to which clamps may be attached, each of which clamps consists of two metallic clamping members 46, which are located on opposite edges of the extensions 43, of the electrodes, and of screw bolts 47, which are passed through suitable openings in the members 46, and are employed to secure said members firmly against the edges of the extensions 43, of the electrodes, which can be done by tightening the nuts 48, on said bolts. Connected to one of the bolts of one of the clamps, at one end of the electrodes is a metal arm 49, and connected to one of the bolts of the clamps at the other end of the electrodes is another metal arm 50, which arms are electrically connected by conductors 51, and 52, respectively, to the transformer.

In Fig. 6, of the drawings, I have shown a modification in the construction of the electrodes, which is similar in every respect to that shown in Figs. 3, and 5, of the drawings, and above described, with the exception that the arms 40, and 41, in this modified construction, is provided with slots or recesses 42<sup>a</sup>, which are formed at right angles with one of the edges of said arms, instead of being inclined as in the other construction, and that the recesses 42<sup>a</sup>, on the arms of one of the groups of electrodes are provided with recesses 42<sup>a</sup>, in their edges opposite the arms of the other group of electrodes. This modified construction of the electrodes is especially intended for use when the supporting rods 28, to 31, inclusive, of the frame 23, are disposed horizontally, while the other construction of the electrodes is better adapted for use, when the supporting rods are vertically disposed, which positions they may be placed in when the parts are being assembled and before the frame is placed in position on the base of the casing. It is obvious, however, that either form of the electrodes may be employed while the supporting rods are horizontally disposed.

The operation is as follows: Air is drawn into the casing 11, through the opening 14, therein, by means of the fan or blower 13, which forces or directs currents of air through the spaces between the electrodes and glass plates which air is accordingly ozonized and driven out of the casing through the opening 17, at its discharging end.

My invention is hereinabove set forth as

embodied in one particular form of construction, but I do not limit it thereto, or to less than all the possible forms in which the invention as hereinafter claimed, may be embodied and distinguished from any prior devices for like purpose.

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

1. In an apparatus for producing ozone, an electrode consisting of a flat piece of metal having an arm extended from two of its opposed edges and provided on its opposed surfaces with projections, said arms having slots to receive supporting members.
2. In an apparatus for producing ozone, an electrode consisting of a flat piece of metal having an arm extended from two of its opposed edges and provided on its opposed surfaces with projections arranged in groups, said projections being formed integral with the metal piece and said arms having slots to receive supporting members.
3. In an apparatus for producing ozone, the combination with a frame, of a series of electrodes mounted on the frame in parallelism with one another, glass plates interposed between said electrodes, each of said electrodes having projections formed integral therewith on its opposed surfaces to contact with the interposed glass plates, and means adjustably mounted on the frame for pressing the electrodes and glass plates toward one another.
4. In an apparatus for producing ozone, the combination with a frame, of a series of electrodes mounted on the frame in parallelism with one another and each having projections formed integral therewith on its opposed surfaces, glass plates interposed between said electrodes, each of said electrodes having an arm extended from two of its opposed edges and provided with slots, supporting members on the frame located in said slots, and means adjustably mounted on said supporting members for pressing the electrodes and glass plates toward one another.
5. In an apparatus for producing ozone, the combination with a frame having end pieces, of a pair of parallel rods connecting said end pieces near their ends, said rods being made of insulating material, a series of electrodes transversely disposed between said rods and each having projections formed integral therewith on its opposed surfaces, glass plates interposed between said electrodes, each of said electrodes having an arm extended from two of its opposed edges and provided with slots to receive said rods, each of said electrodes also having an extension at one of its ends projecting beyond the ends of the glass plates, means adjustably mounted on said rods for pressing the electrodes and glass plates to-

ward one another, and clamping members secured to the extensions on the electrodes at each end of the glass plates.

6. In an apparatus for producing ozone, the combination with a casing having openings in its ends, of a motor mounted within said casing, a fan driven by the motor, connections leading from a source of current to the motor, a transformer mounted within the casing, a frame mounted within the casing, a series of electrodes mounted on the frame in parallelism with one another, and each having projections formed integral therewith on its opposed surfaces, glass plates interposed between said electrodes, each of said electrodes having an arm extended from two of its opposed edges and provided with slots, supporting members on the frame located in said slots, connections from said transformer to the electrodes, and means adjustably mounted on said supporting members for pressing the electrodes and glass plates toward one another.

7. In an apparatus for producing ozone,

the combination with a source of current, of a transformer, a frame having end pieces, a pair of parallel rods connecting said end pieces near their ends, a series of electrodes transversely disposed between said rods and each having projections formed integral therewith on its opposite surfaces, glass plates interposed between said electrodes each of said electrodes having an arm extended from two of its opposed edges and provided with slots to receive said rods, each of said electrodes having an extension at one of its ends projecting beyond the ends of the glass plates, clamping members secured to the extensions on the electrodes at each end of the glass plates, connections from said transformer to each of said clamps, and means adjustably mounted on said rods for pressing the electrodes and glass plates toward one another.

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