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J. C. GAGE
OZONE GENERATOR

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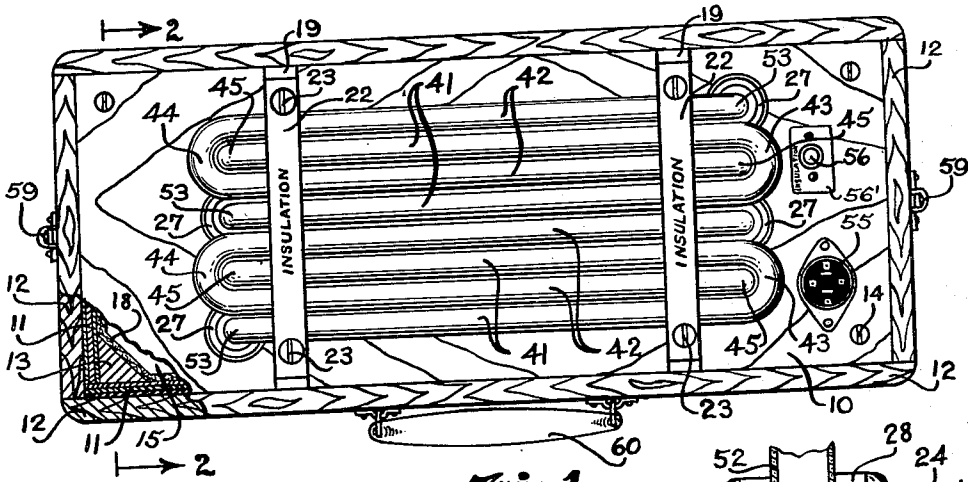


Fig. 1.

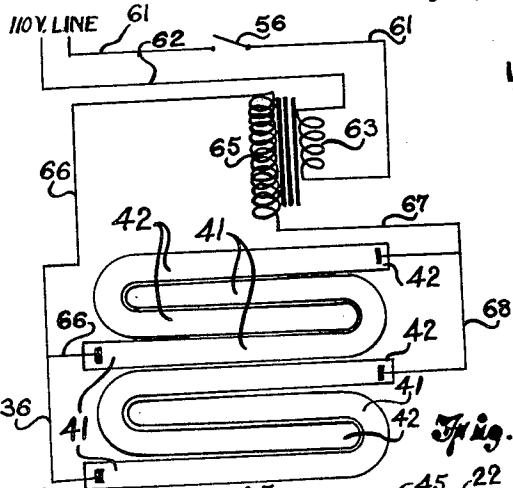


Fig. 4.

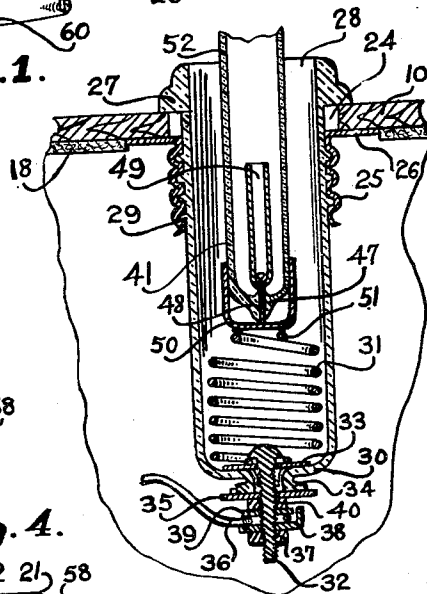


Fig. 3.

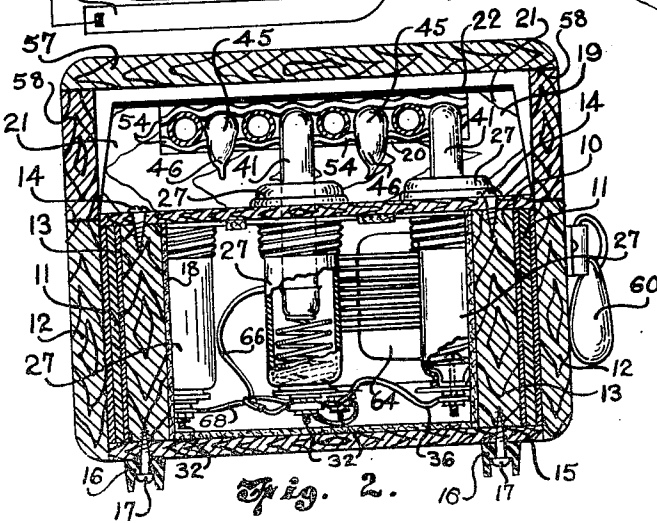


Fig. 2.

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2,328,640

OZONE GENERATOR

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Application October 16, 1941, Serial No. 415,301

12 Claims. (Cl. 204—313)

My invention relates to ozone generators, and more particularly to an ozone generator of the type in which tubes filled with gases that become incandescent upon passing a high voltage current therethrough are utilized for producing the ozone.

In an ozone generator of the above mentioned character it is desirable to have the gas filled tubes exposed so that when the ozone is used for the therapeutic value that it has, the radiation of energy from the tubes and the color of the light emanating therefrom can be utilized to add to the therapeutic effect of the apparatus. The tubes can accordingly be filled with gases that will produce the desired colors, and while gases are utilized in one set of tubes that produce a reddish light, or illumination, within the tubes of that set, and the other set of tubes is filled with gases that produce a bluish light, or illumination, thereof, these are only the predominant colors produced by the light from the tubes, and the other primary colors are also present in the light emanating from the tubes.

In apparatus of the above mentioned character, much difficulty has been experienced in preventing shock to the persons using the apparatus, as, if the apparatus is mounted on metallic supporting means, or in a metallic container, or a container, or a support, having any metal surfaces thereon of any appreciable area, the induced charge built up on this metal will cause shock to anyone touching the same, unless the metal is all grounded. It is frequently very difficult to ground these containers, or mountings, for the apparatus, because of the fact that the apparatus is generally portable, and as a result, due to failure to provide a ground, frequent shocks have resulted from such apparatus of the general character as I employ, which negated the desirable effect produced by the apparatus, and also made the use thereof so unpleasant as to discourage the use thereof by many potential users.

It is accordingly a purpose of my invention to provide an ozone producing apparatus of the above mentioned character that is so constructed and arranged as to produce a large quantity of ozone and to obtain the emanation of light and radiation of energy therefrom above referred to, and which at the same time is so constructed that there can be no shocking of the user of the apparatus due to contact with any of the parts thereof that are exposed. This is accomplished by providing a mounting for the tubes and a housing for the apparatus, generally, that is made

of insulating material, and preferably, of wood.

It is a further purpose of my invention to provide an apparatus of the above mentioned character with a container for certain of the electrical apparatus utilized in conjunction therewith, that is made of wood, in such a manner that it will be protected from fire, should any short-circuits occur, and which is so constructed that the interior thereof is readily accessible, should it be necessary to have access to the interior thereof.

Other objects and advantages of my invention will appear as the description of the drawing proceeds. I desire to have it understood, however, that I do not intend to limit myself to the particular details shown or described, except as defined in the claims.

In the drawing:

Fig. 1 is a top plan view of my ozone producing generator with the cover removed, a portion thereof being broken away.

Fig. 2 is a vertical sectional view of my apparatus, taken near one end thereof, parts thereof being broken away.

Fig. 3 is an enlarged fragmentary sectional view through one of the tube mountings, and

Fig. 4 is a diagram of the electrical connections utilized with my apparatus.

Referring in detail to the drawing, my oxygen generating apparatus is mounted on a supporting member having a top member 10, which is, preferably, of insulating material, such as wood. Said top member forms the top of a container for certain electrical apparatus, which has side walls and end walls that are similarly constructed, said side walls and end walls comprising an inner layer of ply wood 11, that is, laminations of wood with the grain in one ply extending transversely of the grain in the adjacent ply, and an outer covering of wood 12. The corners are braced by means of blocks of wood 13, and to these corner bracing blocks the top member 10 is secured by fastening elements 14. The container is completed by a bottom closure 15, which has the feet 16, of rubber or similar cushioning material, provided thereon, which are secured to the removable bottom member 15 by means of screw-threaded headed fastening elements 17, that also secure the bottom plate member 15 in container closing position, the same engaging the corner blocks 13.

The inner exposed surface of the members 10, 15 and 11 and also, preferably, of the corner bracing blocks 13, are covered with an asbestos fibre coating 18, which is secured by suitable

adhesive to the inner exposed faces of the various members above referred to.

Mounted on the top member 10 are supporting blocks 19 for the gas filled tubes. Said supporting blocks are provided with recesses 20, thus providing a pair of upstanding ears 21 thereon that are provided with flat top faces with which the clamping bars 22, of insulating material, cooperate, said clamping bars being secured in clamping position on the supporting blocks 19 by means of screw-threaded members 23, which also serve to anchor the blocks 19 to the top member 10.

The top member, or top plate, 10 is further provided with a plurality of openings 24 therein, and with metal threaded sleeve-like members 25 depending from said top member 10, into the container of which it forms the top, substantially in alignment with the openings 24, said metal threaded sleeve-like members having flanges 26 secured to the under face of the top member 10.

Mounted in each of the openings 24 is an insulating thimble 27, which is open at the upper end 28 thereof, and which has a threaded portion 29 engaging the threaded member 25, and which has an end 30 that is closed except for a restricted opening therein. Mounted within each of the insulating thimbles 27 is a coiled resilient conducting member 31, the end of which is secured between the head of a screw-threaded headed member 32 and a washer 33 of conducting material. A boss 34 of insulating material projects from the end wall 30 of the insulating thimble and has a washer of conducting material 35 engaging the end thereof, an end of a conductor 36 being connected with the screw-threaded headed member by means of a nut 37 and conducting washers 38 and 39 clamping the conductor 36 therebetween, another nut 40 serving to clamp the head of the screw-threaded headed member 32 against the washer 33 with the coiled resilient conducting member 31 in engagement therewith.

Gas filled tubes are mounted in the insulating thimbles at one end thereof and said tubes are arranged in two sets, one set of tubes extending from the insulating thimbles 27 adjacent one end of the top member 10 and the other set of tubes extending from the insulating thimbles 27 adjacent the one end of the top member 10. Instead of all the tubes being filled with the same gas that serves as a conductor when a high voltage current is passed therethrough, the one set of tubes is, preferably, provided with one mixture of such conductive gases, and the other set of tubes with a different mixture of conductive gases, to thus produce an illuminating effect from the one set of tubes different from that of the other set. Preferably, the gases are such that the combined effect of the light radiating from both sets of tubes contains all the primary colors.

One set of tubes is indicated by the numeral 41 in the drawing, and the other set of tubes is designated by the numeral 42 in the drawing. Said tubes are arranged in alternating relation, so that a tube 41 will be adjacent a tube 42 along the major portion of the length thereof, and vice versa. Said tubes are each bent back upon themselves so as to form a return bend in each thereof, the return bends of the tubes 41 being designated by the numeral 43 and the return bends of the tubes 42 being designated by the numeral 44. One end of each tube extends into an insulating thimble 27 and one end of each tube is sealed shut, said end terminating adjacent the return bend of the next adjacent tube, the sealed ends

of the various tubes being indicated by the numeral 45, the pointed sealed portions 46 thereof extending downwardly, as will be evident from Fig. 2. The tubes 41 are shown as entering the insulating members 27 in Figs. 2 and 3 of the drawing, but it is obvious that the tubes 42 extend in a similar manner into the corresponding insulating members at the opposite end of the device.

Referring to Fig. 3 it will be seen that the gas filled tube 41 has sealed within the end 47 thereof a conducting member 48, which is electrically connected with a tubular electrode 49 within the tube 41, and is connected with a conducting cap member 50 over the outer sealed end thereof, which contacts with a reduced turn 51 at the upper end of the coiled resilient conducting member 31. The length of the depending portions 52 of the tubular members from the bends 53 therein is such that when the tubular members are clamped in position on the top member 10 the resilient members 31 will be compressed and thus a good contact will be made between the conductor leading to the particular insulating thimble 27, such as the conductor 36, and the electrode 49.

The tubular members are arranged in alternating entwined arrangement, such as is clear from Fig. 1, so that there are long parallel runs of said tubes adjacent each other, but with the runs or lengths of the tubes of one set alternating with the runs or lengths of the tubes of the other set, the same being clamped in position in close adjacency, but slightly spaced relation, by means of the clamping bars 22, suitable compressible material 54, which may be felt or rubber or similar material, of a non-conducting character, is provided between the clamping bar 22 and the bottom of the recess 20 in each of the supporting blocks 19, to prevent any damage to the tubes and to hold the same firmly against any vibration or rattle. This is important, because the tendency would be, if the tubes were not so mounted, for the passage of the electric current through the gases contained therein and the discharge between the tubes that is produced, which will be referred to below, to cause hum and noise. Mounted in a suitable recess in the top member 10 is a plug 55, the plug 55 being adapted to have a corresponding plug member of well known character engaged therewith to complete the circuit from a conducting cord to the apparatus. A switch 56 is also mounted on the top member 10, preferably, having an insulating base 56' secured to said top member. A cover 57 of wood having depending side members 58 is, preferably, provided to enclose the apparatus for transportation from place to place, and suitable catches are provided for securing the cover member to the body portion of the device and any suitable handle member 60 is provided for carrying the apparatus.

The switch 56 is indicated diagrammatically in Fig. 4, and conductors 61 and 62 extend from a suitable alternating current supply to the primary 63 of a transformer, the switch 56 controlling the supply of current to said transformer. The transformer is indicated generally by the numeral 64 in Fig. 2, being located within the housing or container of insulating material for the apparatus, and being mounted therein in any desired manner, preferably, being secured in a preferred manner to the underside of the top member 10. The transformer is provided with a secondary 65, having a large number of turns as compared with the primary 63 so as to step

up the voltage of the ordinary house current supply to, preferably, about 7,000 volts, from which the secondary conductors 66 and 67 extend. The conductor 66 extends to the electrode in one tubular member 41 and the conductor 36 extends from the conductor 66 to the electrode in the other tubular member 41. In actual practice, the conductor 36 is connected with both screw-threaded headed members 32 electrically, as will be obvious from Fig. 2, and the conductor 66 is only connected with one of said members to simplify the wiring. A conductor 68 similarly connects the headed screw-threaded conducting members 32 associated with the other pair of tubular members 42, and the conductor 67 extends from the opposite end of the winding 65 from the conductor 66 to the electrode in one of the tubular members 42, while the conductor 68 connects the conductor 67 with the electrode within the other tubular member 42.

Due to the fact that one terminus of the secondary circuit of which the secondary winding 65 forms a part is within the tubular members 42, and the other terminus of said circuit is within the tubular members 41, and in view of the high voltage in the secondary circuit and the close proximity of the tubular members to each other and the conductivity of the gases within the tubular members, current will flow in the secondary circuit, the gases in the tubular members acting similarly to the plates of a condenser, so that there is a discharge from one tubular member 41 to the next adjacent tubular member 42 continuously as long as the switch 52 is closed and the gases within the tubular members 41 and 42 are caused to become incandescent under the flow of alternating current of high voltage there-through. Due to the discharge between the adjacent tubular members, which are, of course, made of glass and are thus of insulating material and constitute a di-electric, the oxygen in the air between these tubes is changed into ozone. Also due to a combination of a heating effect and the change in the character of the gases around the tubes, there is an upward current of gases between the tubes, which causes new oxygen in the air to be constantly passed between the tubes through the zone in which the electrical discharge is taking place.

However, in spite of the high voltage used and the charge built up on the glass tubes, there is no corresponding charge built up on the non-conducting clamping members 22, the supports 19', or the container for the apparatus, made entirely of insulating material, preferably, wood. Accordingly the tubes, as well as the other exposed parts of the apparatus, can be contacted by the user thereof without any danger of shock therefrom, and the apparatus can be brought in as close proximity to the user as may be desired, to get any of the desired effects from the ozone or radiated energy therefrom, as well as the desired effect from the colored illumination produced by the tubes.

What I claim is:

1. An apparatus of the character described, comprising a source of high voltage alternating current, a gas filled sealed tube of transparent non-conducting material having an electrode therein connected with one terminal of said source, a gas filled sealed tube of transparent non-conducting material having an electrode therein connected with the other terminal of said source, the gases in said tubes becoming incandescent upon passing a high voltage current

therethrough and the gas in said first tube producing light of a different color than the gas in said second tube upon becoming incandescent and a mounting for said tubes comprising a housing having stationary tube supporting means thereon, said tubes extending through said housing and having the electrical connections leading to said tubes enclosed within and protected by said housing, said tubes having the major portions thereof arranged in closely adjacent relation in exposed position on the exterior of said housing to provide an air space between said tubes which becomes charged with ozone, the exposed portions of said housing and supporting means being of insulating material.

2. An apparatus of the character described, comprising a source of high voltage alternating current, a stationary gas filled sealed tube of transparent non-conducting material having an electrode therein at one end thereof connected with one terminal of said source, a stationary gas filled sealed tube of transparent non-conducting material having an electrode therein at one end thereof connected with the other terminal of said source, and a mounting for said tubes comprising a housing having stationary tube supporting means on the outer side of the top wall thereof, said tubes having the ends thereof provided with said electrodes extending into said housing and having all the electrical connections leading to said tubes enclosed within and protected by said housing, said tubes having the major portions thereof arranged in closely adjacent relation in exposed position on the exterior of said housing to provide an air space between said tubes which becomes charged with ozone, said tubes projecting from the top of said housing so that said exposed portions thereof can be contacted by a body member the exposed portions of said housing and supporting means being of insulating material.

3. An apparatus of the character described, comprising a source of high voltage alternating current, a stationary gas filled sealed tube of transparent non-conducting material having an electrode therein at one end thereof connected with one terminal of said source, a stationary gas filled sealed tube of transparent non-conducting material having an electrode therein at one end thereof connected with the other terminal of said source, and a stationary mounting for said tubes comprising a housing having tube supporting means thereon, said tubes extending through said housing so as to lie partly within and partly without the same and having said electrodes and the electrical connections leading to said electrodes enclosed within and protected by said housing, said tubes having the major portions thereof arranged in closely adjacent relation on the exterior of said housing substantially in parallelism to the top wall thereof to provide an air space between said tubes which becomes charged with ozone, said major portions projecting above the top of said housing to permit ready bodily contact therewith, the exposed portions of said housing and supporting means being of insulating material, the ends of said tubes having said electrodes therein being remote from each other.

4. An apparatus of the character described, comprising a source of high voltage alternating current, a stationary gas filled sealed tube of transparent non-conducting material having an electrode therein connected with one terminal of said source, a stationary gas filled sealed tube of transparent non-conducting material having

an electrode therein connected with the other terminal of said source, and a mounting for said tubes comprising a wooden housing having stationary spaced wooden tube supporting means projecting upwardly from the top face thereof, said tubes extending through openings in the top of said housing and into the interior thereof, said tubes having the electrical connections leading thereto mounted within and enclosed by said housing, and having the major portions thereof arranged in closely adjacent relation to each other on the top of said housing between said supporting means to provide an air space between said tubes which becomes charged with ozone, said housing having a fireproof lining therein.

5. An apparatus of the character described comprising a box-like housing of insulating material having a plurality of paired openings in the top thereof, a pair of spaced recessed stationary supports of insulating material mounted on and projecting upwardly from said top, said openings lying adjacent said supports but nearer the ends of said housing than said supports, a plurality of adjacent sealed gas filled glass tubes having the major portions thereof extending in parallelism in projecting exposed position in closely spaced relation to each other to provide an air space between said tubes which becomes charged with ozone, said portions extending between said supports in spaced relation to said top and being mounted in the recesses on said supports, said tubes being arranged in sets, the tubes of one set alternating with the tubes of the other set and each tube having an end thereof extending through one of said openings into said housing, the said ends of one set of tubes extending through the one pair of said openings and the said ends of the other set of said tubes extending through the other pair of said openings, and means enclosed entirely within and protected against accidental contact by means of said housing for electrically charging the gas in the tubes of said sets oppositely.

6. An apparatus of the character described comprising a box-like housing of insulating material having a plurality of paired openings in the top thereof, a pair of spaced recessed stationary supports of insulating material mounted on and projecting upwardly from said top, said openings lying adjacent said supports but nearer the ends of said housing than said stationary supports, a plurality of adjacent sealed gas filled glass tubes having the major portions thereof extending between said supports longitudinally of said top in spaced relation thereto and mounted in the recesses on said supports, said tubes being arranged in sets, the tubes of one set alternating with the tubes of the other set to form grid-like discharge means overlying said top to provide air spaces between said tubes which become charged with ozone and projecting above said top in spaced position and each tube having an end thereof extending through one of said openings into said housing, the said ends of one set of tubes extending through the one pair of said openings and the said ends of the other set of said tubes extending through the other pair of said openings, insulating means engaging said tubes to clamp the same to said supports, cushioning means between said tubes, said supports and said insulating means, and means enclosed entirely within and protected against accidental contact by means of said housing for electrically charging the gas in the tubes of said sets oppositely.

7. An apparatus of the character described

comprising a box-like housing of insulating material having a plurality of paired openings in the top thereof, a pair of stationary spaced recessed supports of insulating material mounted upon and projecting above said top, said openings lying adjacent said supports but nearer the ends of said housing than said supports, a plurality of adjacent sealed gas filled glass tubes having parallel portions thereof extending between and mounted in the recesses on said supports in spaced relation to said top in exposed position, said tubes being arranged in two sets and each having a pair of straight portions connected by a curved portion, one of said straight portions terminating in a sealed end exteriorly of said housing and the other straight portion terminating in a down turned sealed end extending through one of said openings into said housing, said straight portions projecting above the top of said housing to provide a grid lying in an exposed position above the top of said housing to provide air spaces between said tubes which become charged with ozone the said ends of one set of tubes extending through the one pair of said openings and the said ends of the other set of said tubes extending through the other pair of said openings, and means enclosed within and protected against accidental contact by said housing for electrically charging the gas in the tubes of said sets oppositely.

8. An apparatus of the character described comprising a box-like housing of insulating material having a plurality of paired openings in the top thereof, a pair of stationary spaced recessed supports of insulating material mounted upon and projecting above said top, said openings lying adjacent said supports but nearer the ends of said housing than said supports, a plurality of adjacent sealed gas filled glass tubes having parallel portions thereof extending between and mounted in the recesses on said supports in spaced relation to said top in exposed position, said tubes being arranged in two sets and each having a pair of straight portions connected by a curved portion, one of said straight portions terminating in a sealed end exteriorly of said housing and the other straight portion terminating in a down turned sealed end extending through one of said openings into said housing, said straight portions projecting above the top of said housing to provide a grid lying in an exposed position above the top of said housing to provide air spaces between said tubes which become charged with ozone the said ends of one set of tubes extending through the one pair of said openings and the said ends of the other set of said tubes extending through the other pair of said openings, an electrode in the sealed end of each tube within said housing means within said housing, for establishing an opposite electrical potential on the electrodes of said sets comprising a step-up transformer, and connections between said transformer and said electrodes, the portions of said tubes provided with said electrodes, said transformer and said connections being all enclosed within and protected against accidental contact by means of said housing.

9. Apparatus of the character described comprising a box-like housing of insulating material having a plurality of paired openings in the top thereof, a pair of spaced recessed stationary supports of insulating material mounted upon and projecting above said top, said openings lying adjacent said supports but nearer the ends of said housing than said supports, a plurality of

stationary adjacent sealed gas filled glass tubes having parallel portions thereof extending between and mounted in the recesses on said supports in spaced relation to said top in exposed position, said tubes being arranged in two sets and each having a pair of straight portions connected by a curved portion, one of said straight portions terminating in a sealed end exteriorly of said housing and the other straight portion terminating in a downturned sealed end extending through one of said openings into said housing, the downturned ends of one set of tubes extending through one pair of said openings and the downturned ends of the other set of said tubes extending through the other pair of said openings, and said curved portions of one set of tubes embracing the exterior sealed ends of the other set of tubes, said sets of tubes being alternately arranged in closely spaced inter-fitting relation to form a grid extending substantially parallel to and overlying said top and projecting above the same in an exposed position to provide air spaces between said tubes which become charged with ozone, means within said housing for establishing an opposite electrical potential on the electrodes of said sets comprising a step-up transformer, and connections between said transformer and said electrodes, the portions of said tubes provided with said electrodes, said transformer and said connections being all enclosed within and protected against accidental contact by means of said housing.

10. Apparatus of the character described comprising a box-like housing of insulating material having a plurality of paired openings in the top thereof, a pair of spaced recessed stationary supports of insulating material mounted upon and projecting above said top, said openings lying adjacent said supports but nearer the ends of said housing than said supports, a plurality of stationary adjacent sealed gas filled glass tubes having parallel portions thereof extending between and mounted in the recesses on said supports in spaced relation to said top in exposed position, said tubes being arranged in two sets and each having a pair of straight portions connected by a curved portion, one of said straight portions terminating in a sealed end exteriorly of said housing and the other straight portion terminating in a downturned sealed end extending through one of said openings into said housing, the downturned ends of one set of tubes extending through one pair of said openings and the downturned ends of the other set of said tubes extending through the other pair of said openings, the sets of tubes containing gases producing illumination upon being ionized, the tubes of one set producing a reddish illumination and those of the other set a bluish illumination, means within said housing for establishing an opposite electrical potential on the electrodes of said sets comprising a step-up transformer, said straight portions forming an exposed grid extend-

ing substantially parallel to and overlying the top of said housing to provide air spaces between said tubes which become charged with ozone and projecting above said top to permit ready contact therewith and connections between said transformer and said electrodes, the portions of said tubes provided with said electrodes, said transformer and said connections being all enclosed within and protected against accidental contact by means of said housing.

11. An apparatus of the character described, comprising a source of high voltage alternating current, a stationary gas filled sealed tube of transparent non-conducting material having an electrode therein connected with one terminal of said source, a stationary gas filled sealed tube of transparent non-conducting material having an electrode therein connected with the other terminal of said source, and a mounting for said tubes comprising a wooden housing having stationary wooden tube supporting means on the top thereof, said tubes having depending end portions extending through openings in the top of said housing and into the interior thereof, said tubes having the electrical connections leading thereto mounted within and enclosed by said housing and having the major portions thereof arranged in closely adjacent relation on the exterior of said housing in spaced relation to the top thereof to provide an air space between said tubes which becomes charged with ozone and to project said major portions above said top in an exposed easily contacted position without interference of said housing with such contact.

12. An apparatus of the character described, comprising a source of high voltage alternating current, a stationary gas filled sealed tube of transparent non-conducting material having an electrode therein connected with one terminal of said source, a stationary gas filled sealed tube of transparent non-conducting material having an electrode therein connected with the other terminal of said source, and a mounting for said tubes comprising a wooden housing having stationary spaced wooden tube supporting means on the top wall thereof, said tubes having depending end portions extending through said top wall into said housing and having the electrical connections leading to said tubes enclosed therein, said tubes having the major portions thereof arranged in closely adjacent relation on the exterior of said housing along said top wall but upwardly spaced therefrom so as to lie in an exposed position projected above said top and provide an air space between said tubes which becomes charged with ozone, said housing having a detachable bottom wall providing access to the interior of said housing having feet of cushioning material thereon, and elements for detachably securing said bottom wall in closing position, said elements also securing said feet in position.

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