No. 832,767. PATENTED OCT. 9, 1906.

J. H. BRIDGE.

ELECTRICALLY TREATING AIR OR OTHER GASES.

APPLICATION FILED APR. 3, 1906.

Fig. 1.

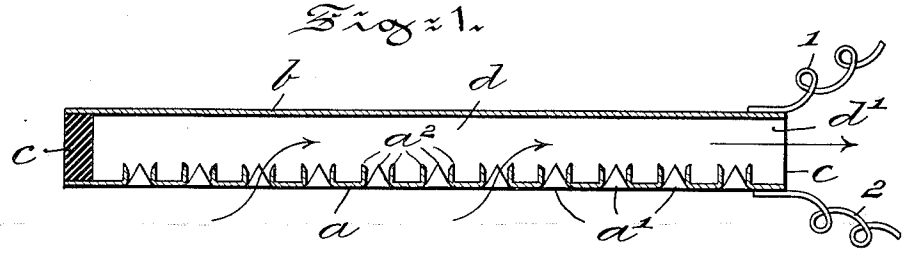


Fig. 2.

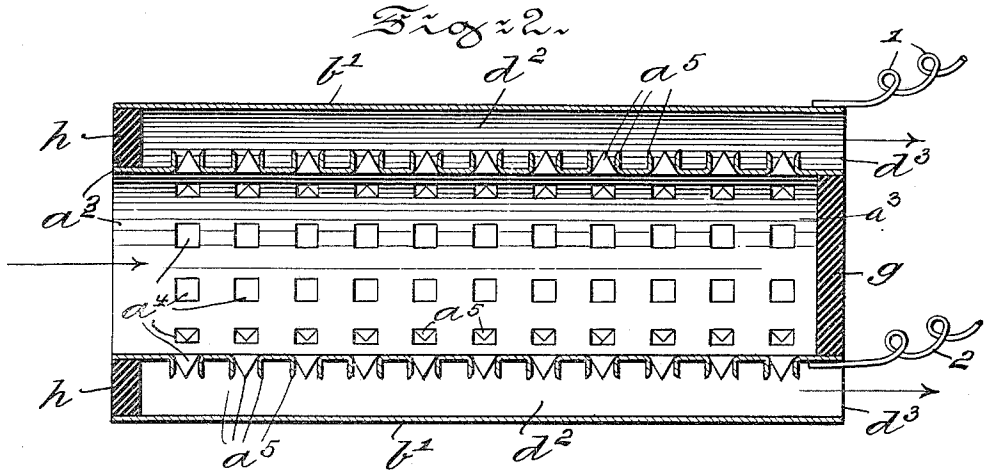


Fig. 3.

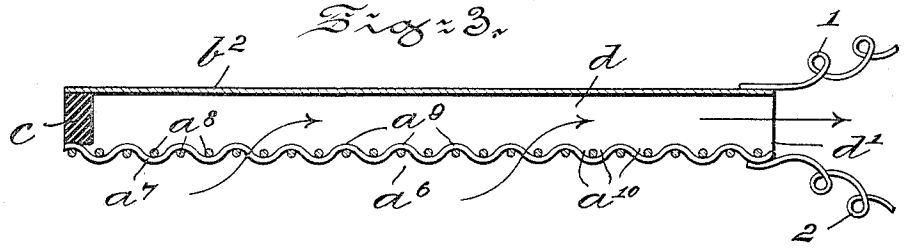
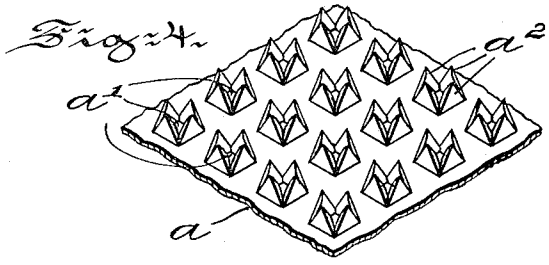


Fig. 4.



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UNITED STATES PATENT OFFICE.

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ELECTRICALLY TREATING AIR OR OTHER GASES.

No. 832,767. Specification of Letters Patent. Patented Oct. 9, 1906.

Application filed April 3, 1906. Serial No. 309,620.

To all whom it may concern:

Be it known that I, JAMES H. BRIDGE, a subject of the King of England, (but having declared my intention of becoming a citizen of the United States,) residing at the cit of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in the Art of Electrically Treating Air and other Gases, of which the following is a specification.

My invention has relation to the art of electrically treating air or other gases; and in such connection it relates more particularly to the mode of conducting air or other gas transversely through an electrode in finely-divided streams substantially in the path of multitudinous electric discharges, so that each minute air-stream is surrounded by one or more electric discharges to insure an intimate contact of the air or other gas with such electric discharges.

The principal objects of my invention are, first, to convert the oxygen of the air into ozone by means of a silent brush discharge or violet effluvium or to modify other gases by conducting the same from one side of a perforated electric means to the other side thereof through the perforations, thus projecting them substantially into the path of electric discharges passing between said perforated means and other means; second, to so guide the air or other gas so that the same is subdivided into small streams and each stream passed sustantially into the path of electric discharges at the place on the electrode where the discharges originate and in the same direction as the discharges or in an opposite direction thereto; third, to so arrange around each of the perforations of an electric means a plurality of projections or elevations from which or to which a discharge is adapted to pass under an appropriate electric impulse, so that the small streams of air or other gas passing through the perforations also pass substantially into and through the core of the numerous electric discharges proceeding to or from such points or projections to bring the gaseous molecules into intimate contact therewith by prolonging the coincidence of the respective paths of the air-currents and the electric discharge, and, fourth, to interpose baffles, checks, or other guides in the air or gas currents to prevent their reaching the discharging-surface of an electrode, except transversely through the perforated body of such electrode directly into the core of an electric discharge or discharges.

The nature and scope of my present invention will be more fully understood from the following description, taken in connection with the accompanying drawings, forming part hereof, in which—

Figure 1 is a diagrammatic view illustrating, partly in section and partly in elevation, of means consisting of a perforated conductive metal plate having projections on one side surrounding each of the perforations of the plate, a plate arranged a certain distance above the projections of the perforated plate, an insulating or other body interposed between and arranged at certain ends of the plates, forming in conjunction therewith an opening at one end of said means, and an electric conductor connected with each of the plates, all embodying features for carrying into effect my said invention. Fig. 2 is a similar view illustrating, partly in section and partly in elevation, a modified form of means consisting of a tubular perforated conductive body having projections or elevations on the exterior surface surrounding each of the perforations in the body, a second tubular solid body surrounding the perforated body, and means for closing the perforated body at one end and both bodies at the end opposite thereto. Fig. 3 is a similar view illustrating, partly in section and partly in elevation, a still further modified form of means in which the perforated conductive body is replaced by a wire-netting; and Fig 4 is a detail view illustrating perspectively the perforated plate shown in Fig. 1.

Referring to the drawings, with reference to Fig. 1 thereof, *a* represents a conductive metal plate or body having arranged therein, preferably at certain distances apart, openings *a'*, which are provided on one side of the plate *a* with projections or elevations a^2, formed either by first cutting the plate and then bending the cut portions outward or by forming the conical projections in the plate and then splitting or cutting the apex of each cone and spreading apart the same. In this manner a plurality of projections or elevations a^2 are formed integral with the plate *a*, surrounding each of the openings *a'* therein, which openings, according to the manner of forming the elevations a^2, may be square or circular in outline. A certain distance

above the free ends of the projections a^2 is arranged a second conductive plate b, which is separated from the perforated plate a in the present instance by a U-shaped frame c, of insulating material, forming, in conjunction with the plates a and b, a chamber d, having an outlet d'. Conductors 1 and 2 connect the plates a and b, forming electrodes, with a source of electric energy, (not shown,) which serves to conduct a current through the same. As is well known, the discharge of electricity will take place between the free end of the projections a^2 and the electrode b, and owing to the arrangement of the projections the discharges will assume a substantially annular shape. In order to convert the oxygen of the air into ozone, the same is caused to travel in numerous streams through the openings a' of the electrode a from one side of the plate to the other in the direction indicated by the arrows, where it reaches the exact place in the surface of the electrode a where the discharge originates and then, guided by the projections a^2, travels with the discharge substantially along the same path toward the electrode b. The air or other gas being thus forced to travel in the same plane as the electric discharges and by being divided into fine streams each of which is enveloped by the silent brush discharge or violet effluvium, an intimate contact of the gaseous molecules and electric vibrations will take place, and thus the oxygen of the air is converted into ozone. The air so treated is forced to leave the chamber d through the outlet d', and from thence it may be conducted to any point for utilization or storage. (Not shown.) If other gas than air is to be treated, the same will be conducted through the electrode a from one side to the other and substantially through the core of the electric discharge in the same manner as hereinbefore described in connection with the treatment of air.

Instead of using a flat electrode, such as is shown in Fig. 1, a curved or tubular electrode a^3 may be employed, which is compassed by a complementally-shaped electrode b to that of the electrode a^3. In this instance the electrode a^3 is closed at one end by a plate g, while an annular insulation h separates the electrode a^3 from the electrode b' and at the same time closes a chamber d^2, formed between the electrodes at the end opposite the plate g. Air entering the interior of the electrode a^3 passes in a plurality of streams through the openings a^4 into the chamber d^2 and substantially through the cores of the electric discharges taking place between the free ends of the projections a^5, surrounding each of the openings a^4, and the electrode b'. The air or other gas so treated leaves the chamber d^2 through the outlet d^3 of the same. The electrodes a^3 and b', if desired, may be replaced by a wire netting or gauze a^6, in which the strands a^7 at the points where the same pass over the strands a^8 form elevated portions a^9, projecting above the strands a^8, between which and the electrode b^2 the electric discharges will pass. In this instance the air or other gas passes through the meshes a^{10}, formed by the intersection of the strands a^7 and a^8 of the wire netting or gauze a^6, and will also be caused to travel substantially through the cores of the electric discharges to thus be brought with its molecules into intimate contact with the electric discharges.

The projections surrounding the perforations may be omitted, if desired, in which case the silent discharge will pass from the outer surface of the electrode in the plane of the air-currents proceeding from the inner side of the electrode through the perforations and will assume in respect to such air-currents a substantially annular form, surrounding the air-streams and modifying their molecular arrangement.

While I have used the silent brush discharge or violet effluvium in the production of ozone from air or oxygen to illustrate my invention, employing the usual dielectrics or resistances to prevent arcing and sparking, the same method of conducting air in a plurality of streams from one side of an electrode to its discharging-surface may be employed for the electrification of air or other gases by means of the arc or spark discharge.

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The mode of electrically treating air or other gas by the silent discharge, which consists in forming on the surface of a perforated electrode a plurality of substantially annular electric discharges, and leading air or other gas in minute streams from the under— or inner—side of the electrode through its perforations substantially into the interior of said annular electric discharges, then causing the streams of air or other gas to travel substantially along the interior of the annular discharges in the same plane, then passing them transversely through the luminous walls of the discharges to bring them into intimate contact with the discharges, and finally reuniting the streams of air or other gas and leading them in volume away from the discharge.

2. The mode of electrically treating air or other gas by the silent brush discharge, which consists in forming on the surface of an electrode electric discharges surrounding a plurality of air-spaces, then causing air or other gas to pass in minute streams by perforations or other openings transversely through the body of the electrode substantially into the interior of such air-spaces, then causing the streams of air or other gas to break through the walls of the discharges

to secure actual contact therewith, and then reuniting them for withdrawal from the action of the discharges.

3. The mode of electrically modifying air or other gas by the silent brush discharge, which consists in passing air or other gas in minute streams from one side of a perforated electrode to the other through the perforations thereof, then forming an electric discharge or discharges upon the surface of the electrode substantially around each separate air-stream as it emerges from a perforation, then causing the path of each stream of air or other gas and the path of its surrounding discharge or discharges to coincide, then passing each separate stream of air or other gas through the walls of its surrounding discharge or discharges and finally causing the separate air-streams to reunite and leading them in volume from the action of the discharges.

4. The mode of electrically modifying air or other gas, which consists in substantially surrounding with silent discharges a plurality of perforations or openings on the surface of an electrode, directing air or other gas in fine streams through the perforations into the interior core of such discharges, then continuing each stream of air or other gas emerging from the perforations in an outward jet from the surface of the electrode, while simultaneously causing the electric discharge to assume a more or less elongated shape in the same plane as the air-current and substantially surrounding it, then causing the jet of air or other gas to pass transversely through the luminous walls of the discharge to bring it into intimate contact therewith and finally reuniting the separate jets of air or other gas to withdraw them from the action of the discharge.

In witness whereof I have hereunto set my signature in the presence of two subscribing witnesses.

JAMES H. BRIDGE.

Witnesses:
J. WALTER DOUGLASS,
THOMAS M. SMITH.