

L. I. BLAKE.
 PROCESS OF AND APPARATUS FOR THE PRODUCTION OF IONS.
 APPLICATION FILED MAY 16, 1908.

937,759.

Patented Oct. 26, 1909.

Fig: 1.

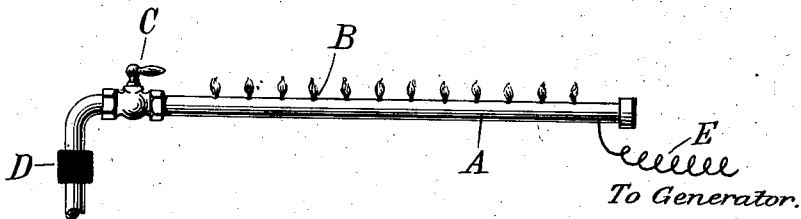
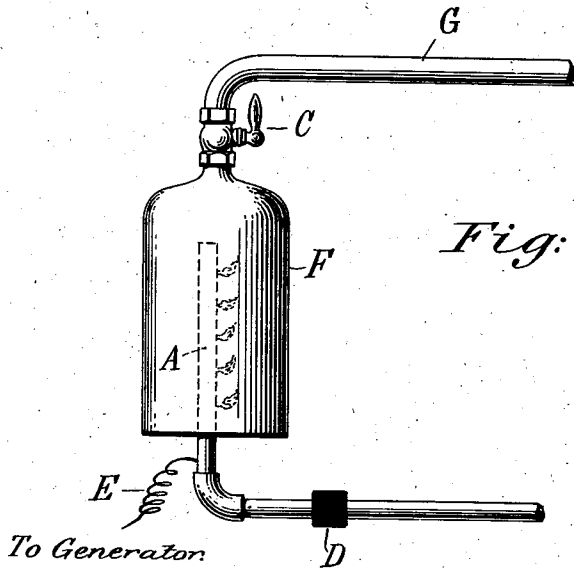


Fig: 2.



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PROCESS OF AND APPARATUS FOR THE PRODUCTION OF IONS.

937,759.

Specification of Letters Patent.

Patented Oct. 26, 1909.

Application filed May 16, 1908. Serial No. 433,328.

To all whom it may concern:

Be it known that I, LUCIEN I. BLAKE, a citizen of the United States, residing at Denver, in the county of Denver and State of Colorado, have discovered a new and useful Process of and Apparatus for the Production of Ions; of which the following is a specification, reference being had to the drawings accompanying and forming a part of the same.

It has been ascertained by the researches of physicists that in flames, such as produced by an ignited gas jet or by the electric arc, large quantities of gaseous particles exist which carry minute charges of electricity, some positive, others negative, the development of which appears to be the result of a dissociation by high temperature of the gaseous substances present. Experimental investigations show that of these products of dissociation the positive particles have equal and definite individual charges, and that their mass and material are practically those of the individual atoms of the gaseous components. The negative products, however, although possessing individual charges equal in quantity to those of the positive, have masses of approximately 1/1700 only of the atom of hydrogen, which is the smallest and lightest atom known. These negative particles, moreover, are all alike in material, being, in this regard, entirely independent of the gas from which they are derived. They are, therefore, unlike anything previously known in nature, and are called negative ions. These negative ions are all alike in mass and charge regardless of the kind of atom from which they are derived by dissociation. They are therefore elemental, and have been appropriately designated atoms of negative electricity.

No analogous atom of positive electricity having a mass similarly less than any known atom has yet been discovered, the positive ion in the flame or arc being, therefore, the remnant or remainder of the gaseous chemical atom after the negative ion has been dissociated from it. While its charge is always equal to that of the negative ion, its own mass is at least 1700 times greater, and is proportional to the mass of the atom of the dissociated gas. It exists in the flame, therefore, with atomic mass, as a positive atomion, so called. The heat of a flame, of the electric arc, or of incandescing solids

such as glowing coals, thus produces both positive atomions and negative ions from the gases present, all having equal charges, but unequal masses. In the following specification the term ion is used as the common term for either of these first products of dissociation in a flame. Because of these charges, these ions are capable of attaching themselves to neutral atoms or molecules, and are then called molions. Charged aggregates may thus occur, both positive and negative, with ions as their nuclei, and this fact I have taken advantage of in various arts, with such novel and useful results as to render the production of ions under practical commercial conditions a matter of the greatest value and importance.

The subject of my present application is a discovery which I have made of a simple, economical and efficient process for the production or development of ions in any desired quantities, and an apparatus for carrying out such process and rendering it available for practical and useful purposes.

My discovery, briefly stated, is, that if a flame, an arc, or an incandescing solid be electrified or electrically charged, ions are produced in it in enormously increased quantities and are delivered from it into the surrounding air. I have been able, by the application of this discovery, to provide in a flame or its equivalent, electrified from an external source, a powerful generator of ions, producing them in far greater available quantities than by any other previously known process or device.

A typical and very simple means for carrying out my invention consists of a metal gas-pipe, having a series of small gas jets, spaced along its length. The burning gas jets become electrified if placed in an electrical field, or if the pipe be insulated and connected with some source of electro-motive force, as for example, to one pole of a static generator, or one terminal of a suitable high-tension transformer secondary. This pipe may then be placed at the point where the ions are to be utilized, or at some remote point, and the ions conveyed to the desired point by a current of air or gas in a suitable conduit.

For a more detailed explanation of the nature of my process and of the means for carrying the same into effect, I refer now to the accompanying drawings, which, while

largely diagrammatic, will be readily understood, as the devices represented are all of a very simple and well known character.

Figure 1 is a perspective view of the most simple form of ionizer. Fig. 2 is a similar view of an ionizer with provision for conducting the ions to a more or less remote point.

In Fig. 1, A designates a section of an ordinary metal gas pipe, closed at one end and containing a series of jets or openings B, and a controlling valve C. The pipe is connected with, but at D insulated from a main or pipe from any convenient source of gas supply, such as the street mains, and is connected to a source of electro-motive force, as by attachment to one terminal of the high tension secondary E of a transformer, or one pole of a static generator. The gas jets, when ignited, are by this means electrified or statically charged, and produce and give off in great quantities gaseous ions which may be utilized for various useful purposes. As one instance of such uses, I may cite, although it forms no part of the subject matter of the claims of this application, a process which I have discovered for the concentration of ores.

If a quantity of metalliferous ore be pulverized and allowed to fall in a fine stream upon a revolving metal drum or cylinder, the conducting as well as the non-conducting particles will fall from the drum in practically the same path. But, if the gas pipe with its ignited and electrified jets, illustrated in Fig. 1, be placed in proximity to the descending stream of pulverized ore, the ions developed in and given off from the flames will attach themselves to the particles of the ore and individually electrify such particles forming molions. Some will be positive and some negative. If now, the conducting surface of the drum upon which the stream of finely divided material is delivered, be electrically connected to earth, the charged particles of relatively good conductivity will become instantly neutral, while the particles of lower conductivity will adhere to the surface and may be separated therefrom by scrapers or allowed to detach themselves when they have parted with their charge. In this way the conducting particles will fall from the drum in a different path from the less conducting particles.

It is not necessary that the substance to be acted upon by the ions should be brought into action or even approximate contact with the flame itself, as I have discovered that it is possible to convey the ions to a distance from the flame, and for utilizing this discovery I have devised a form of ionizer, from which the ions may be conveyed and delivered to remote devices.

One embodiment of this form of apparatus is illustrated in Fig. 2, in which F rep-

resents a closed chamber of insulating material, composed, for example, of earthenware. Within this chamber the gas pipe A, insulated, as in the previous case from the service pipe at D, is placed and connected as before with a suitable source of electro-motive force E. From the top of the chamber F, leads an insulating pipe or conduit G, which may be a wooden pipe or an ordinary rubber hose. If, when the gas jets are ignited and electrified, a current of air or gas be established by natural or artificial draft through the chamber F, to and through the pipe G, the ions developed by the flames may be conveyed by such current of air to such points comparatively remote, as may be desired.

If the source of the ions be an electric arc, it may be charged or electrified by producing the arc itself in an electrified field, whereby the ions of opposite sign to the field will be delivered into the air outside, or they may be forced out by a magnet pole placed near the arc. Similarly, a receptacle containing glowing coals, or other incandescing body, may be electrified.

While both positive and negative ions are produced in a flame, or by an incandescing solid, they may be separated from each other, when so desired, by means of electro-magnets which will deflect them in two directions so that they may be collected and used separately. Or, if the flame, notably when electrified, is produced between two plates oppositely charged, or in general is produced in an electrified field, a similar separation of the two kinds of ions will result.

I have discovered other important and useful methods of utilizing ions, and devised other forms of apparatus for producing them, but these will be made the subject of, and more fully described in other applications for Letters Patent. It is my purpose in the present case to illustrate the fundamental method or process of generating and rendering available ions on a scale suitable for useful and practical application by electrically charging or electrifying the flame or other source by which the ions are produced, and the best form of apparatus known to me at this time for carrying out such process.

Having now described my invention, what I claim is:—

1. The process of producing and delivering into the air gaseous ions, herein described, which consists in electrically charging by an external source of electro-motive force, the generating or gaseous dissociating flame or source of heat in which they are developed.

2. An ionizer consisting of an incandescing body charged or electrified by an external source of electro-motive force.

3. An ionizer consisting of a conducting

gas supply pipe, insulated from ground, and charged or electrified by an external source of electro-motive force, and provided with a series of jets or burners.

5 4. An ionizer consisting of a series of jets or burners connected with a source of gas supply, but insulated from ground, and charged or electrified by an external source of electro-motive force.

10 5. An ionizer consisting of an insulated and electrified source of heat in combination with an insulating casing provided with an insulating pipe or conduit for conveying therefrom to the point desired, the air carry-
15 ing the ions.

6. The combination with an insulating in-

closing chamber, and an air or gas conveying conduit leading therefrom, of an ionizer contained in said chamber consisting of an insulated electrically charged ignited gas jet 20 or flame.

7. The process herein described, consisting in electrically charging by an external source of electro-motive force a gaseous dissociating flame or source of heat, and separating 25 the positive and negative ions produced and given off thereby by means of magnets or their equivalents.

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Witnesses:

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