A. BLONDEL.

ARC LAMP.

APPLICATION FILED JAN. 15, 1906.

992,479. Patented May 16, 1911.

3 SHEETS—SHEET 1.

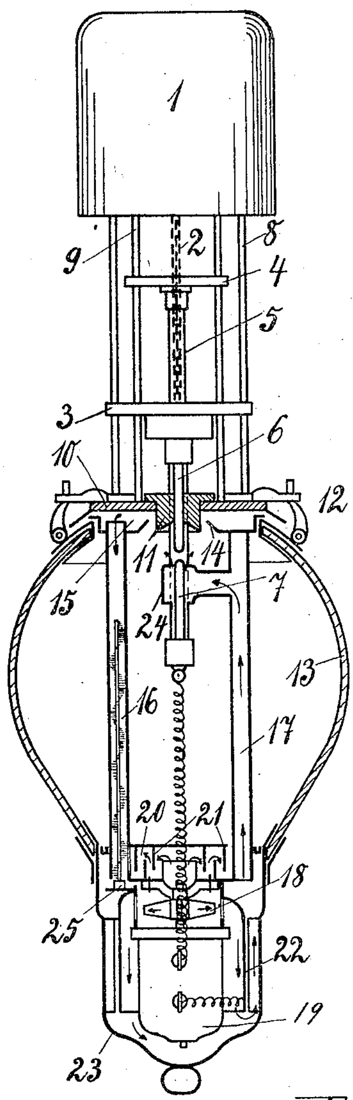
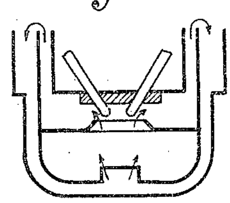


Fig. 1

Fig. 8



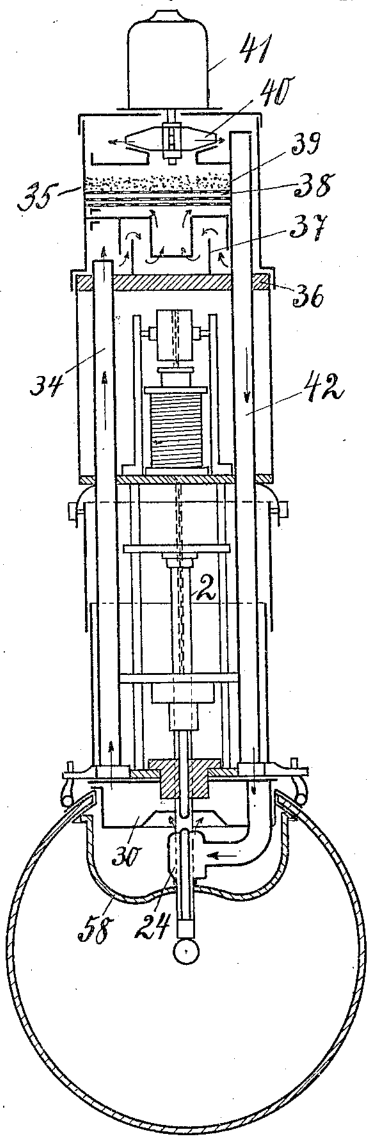
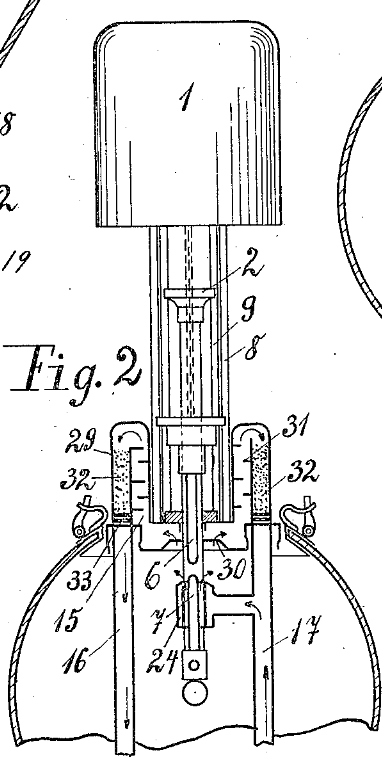


Fig. 3

Fig. 2



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3 SHEETS—SHEET 2.

Fig. 4

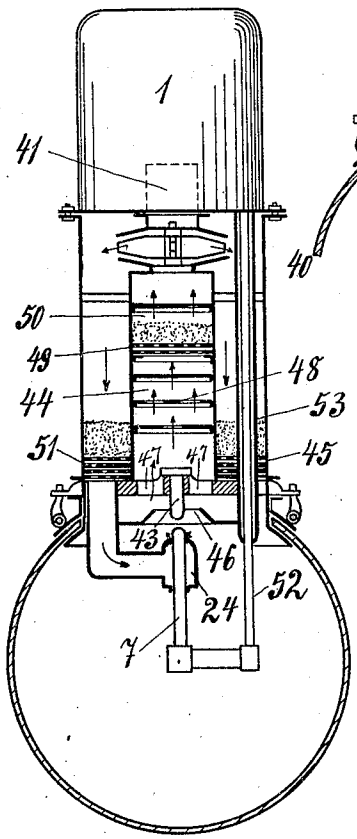


Fig. 6

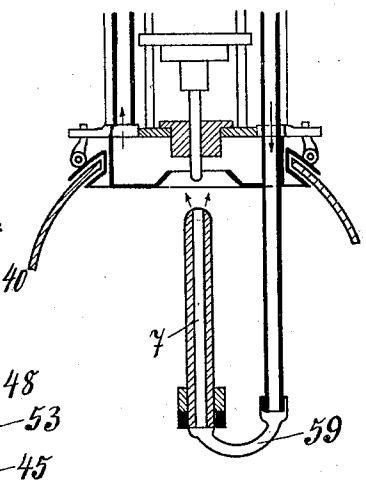


Fig. 7

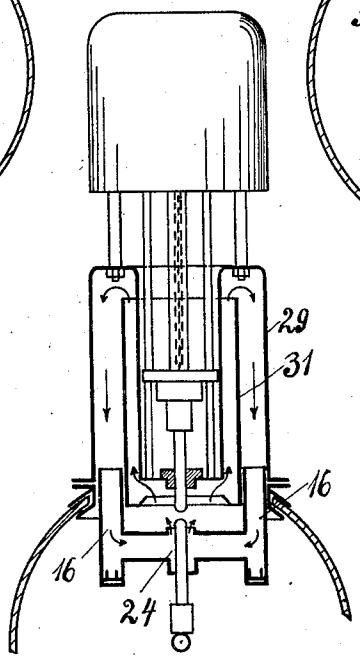
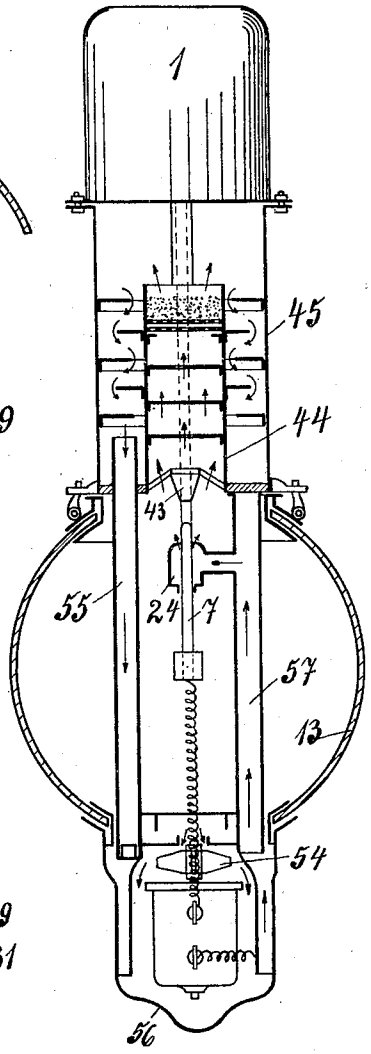


Fig. 5



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3 SHEETS—SHEET 3.

Fig. 9.

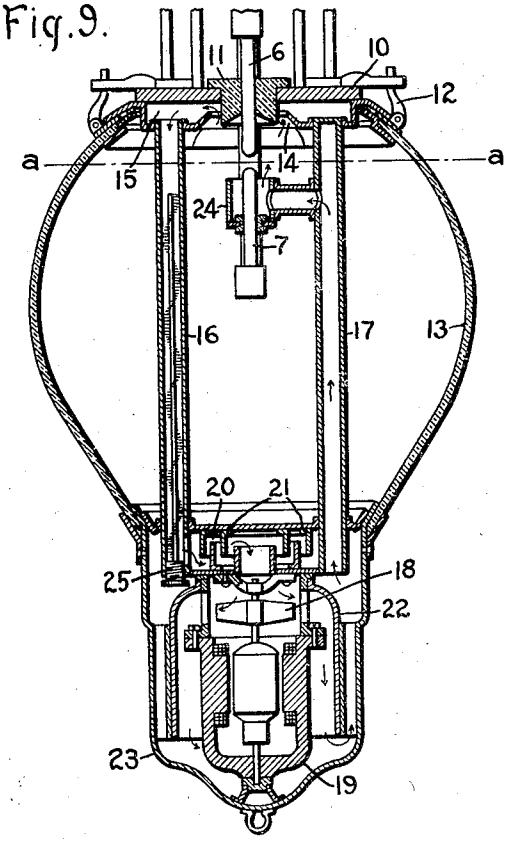


Fig. 10.

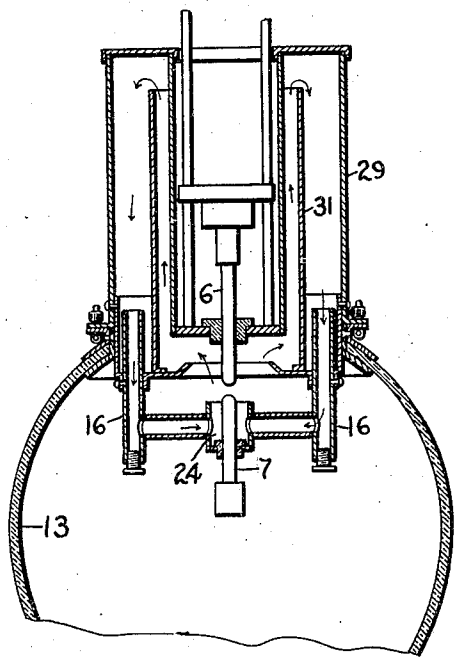


Fig. 11.

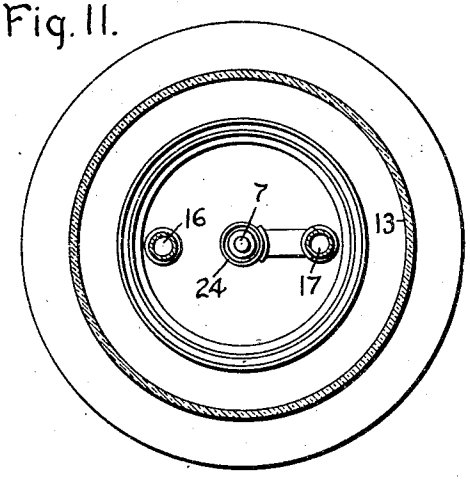
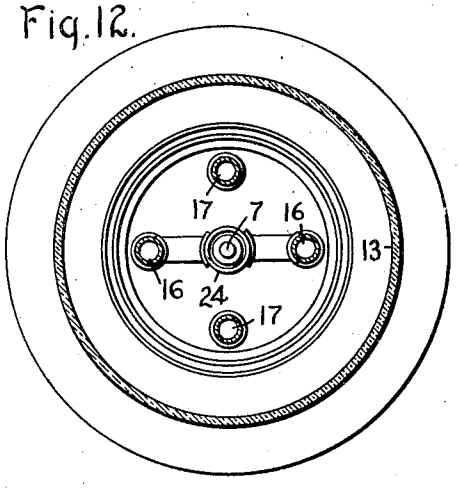


Fig. 12.



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UNITED STATES PATENT OFFICE

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ARC-LAMP.

992,479 Specification of Letters Patent. Patented May 16, 1911.

Application filed January 15, 1906. Serial No. 296,147.

To all whom it may concern:

Be it known that I, ANDRÉ BLONDEL, a citizen of the Republic of France, residing at 41 Avenue de la Bourdonnais, Paris, France, have invented a new and useful Improvement in Arc-Lamps, which improvement is fully set forth in the following specification.

Carbons or electrodes containing mineral substances are consumed less quickly in an arc lamp when a closed globe is employed, and as great advantages from the point of view of length of working are obtained as with ordinary carbons, but perfectly satisfactory results have hitherto not been obtained by reason of the lack of sufficiently good means for aspirating and condensing the fumes as they are produced and also because the path of the fumes in the globe has not been so limited as to prevent deposit upon the said globe.

In a lamp in which carbons impregnated with light giving salts are used, solid products of combustion are evolved from the arc usually in the form of rather copious white fumes, and attempts to inclose such an arc have usually resulted in the deposit of the fumes upon the globe, and this obstructed the light and seriously decreased the efficiency of the lamp.

My invention consists in providing in an inclosed lamp of this character a conduit for the gases evolved from the arc in which the gases are received at a point just above the arc and which returns them to the arc space at a point below the arc; and during this portion of their travel the gases are confined to the conduit and kept out of contact with the globe. For the purpose of creating and maintaining a circulation of the gases, I may either rely upon the natural draft produced in the circulatory system by the heat of the arc, or I may provide an artificial means for producing such a draft, the choice depending largely upon the character of the impregnated electrodes and of the circulatory system itself. Under certain conditions, it is desirable to place a filtering means within the circulatory system and under these conditions, particularly, I find it desirable to provide the artificial means for producing the draft. It is to be understood, however, that the essence of my invention consists in providing a circulatory system for the gases, in which the gases are received and led from a point just above the arc to the space below the arc by a conduit or conduits distinct from the globe and in which deposit may take place.

In the drawings Figure 1 shows a partial vertical section, but rather diagrammatically, of a lamp embodying my invention; Figs. 2, 3, 4, 5 and 6 are like views of modifications of the structure shown in Fig. 1; Fig. 7 shows a like view of another modification in which the artificial means for producing a draft are dispensed with; Fig. 8 shows a diagram of my invention applied to an arc lamp in which converging electrodes are employed; Figs. 9 and 10 are vertical sectional views showing somewhat more in detail the arc lamp structures of Figs. 1 and 7 respectively; Fig. 11 is a horizontal sectional view taken through Fig. 9 on the line *a*—*a*, and Fig. 12 is a modification of the construction shown in Fig. 11.

Referring now to the drawings, Fig. 1 shows an arc lamp in which the mechanism is contained in a closed box 1, from which descend the chains or movable connections 2, which support the cross bars 3 of the upper carbon carrier and the cross bar 4 to which the rod 5 controlling the lower carbon carrier is fixed.

The upper and lower electrodes, of which at least one is mineralized, are indicated by reference numerals 6 and 7 respectively, while the rods for guiding the bars of the upper and lower carbon carriers are represented by the numerals 8 and 9. A cover 10 closes the upper portion of the combustion chamber, the said cover being carried by fixed rods and provided, if desired, with an economizer 11, through the center of which the upper electrode passes.

To the cover 10 is fixed by means of suitable attachments 12 the globe 13 which forms an air tight joint with the cover 10.

Above and surrounding the arc is arranged a reflector 14 and an annular chamber 15 provided if necessary with suitable precipitating means such, for example, as the baffles and filters, indicated in Fig. 2, in order to cause the deposit of the densest fumes. From this chamber 15 starts a suitable number of tubes such as 16 (see Figs.

1, 2 and 9) in which the fumes, the path of which is shown by arrows, descend.

At the lower portion of the globe 13, there is placed a suction fan 18 driven by an electric motor 19 suitable to the current employed, as will be explained later; the said fan sucks the gases which pass downward through pipes 16, through a condensing chamber 20 preferably provided with baffles 21 or filters. This chamber is fixed to the lower portion of the tubes 16 with which it communicates. From the fan the gases are carried downward for example by means of a metal receiver 22 thus increasing the cooling surface to which the gases are exposed and are allowed to rise into another receiver surrounding the first, fixed to the globe and they thus reach the tube 17 which brings them back into the neighborhood of the arc; from the tube 17 starts a horizontal pipe which opens into a cylindrical sleeve 24, the upper portion of which is open while the lower portion of it is closed by a plate provided with a hole just sufficient for the passage of the lower electrode. In this manner the gases escape through the orifice surrounding the point of the electrode and at once pass the arc, and then into the chamber 15 without descending into the globe. By this means, if the fan be rotated by means of an electric current taken in series or in shunt from the current passing through the arc, it causes the gases to circulate briskly in the path indicated and thus forces them to cool upon the large condensing surface of the receiver 23 in such a manner that they are thoroughly cleaned. Their degree of cleanliness is again improved if filters, for example, sponges or helicoidal brushes formed of wires, as indicated by the lines in the tube 16, or other filtering arrangements are placed in the tubes 16 and 17. When the globe 13 is lowered the receiver 23, the motor 19 and the fan 18 descend with the globe and the tubes are then exposed so that the brushes can be introduced into and withdrawn from the tubes by means of the caps or stoppers 25 which close the lower end of the tubes. In this manner there is easy access to the tubes for cleaning them. The fan 18 may for example be fixed beneath the bottom plate of the chamber 20 as shown in Fig. 1 and is removed with it; this allows not only of cleaning the inside of the chamber 20, but also of removing the fan for inspecting it or replacing it by another if there is need of repair. The motor 19 of the fan which may be series or shunt wound is preferably connected in series with the arc by placing one of its poles in connection with the metal of the lamp and of the tubes 16 and 17 and by connecting the other pole by means of a flexible wire (see Fig. 1) to the lower carbon carrier (which dispenses with any other current lead to this carbon carrier if it is insulated from the metal as well as from the upper carbon carrier).

The surfaces for depositing and cooling the fumes may of course be multiplied. But the deposit and purification may be also assisted, as will be seen, by causing the gases from the neighborhood of the arc to pass either through pieces or grains of mineral substances tending to promote the chemical purification of the gases. Among substances favorable to such purification, there may be mentioned in particular ammoniacal salts such as ammonium carbonate, alkaline substances such as the oxids or carbonates of potassium or sodium, soda, lime, the salts of protoxid of iron, etc. When employing granular mineral substances, the arrangement may for example be that shown in Fig. 3.

The purification effected may, as is seen, be both physical and chemical; the object of the chemical purification is above all that of eliminating, so soon as produced, the nitrous vapors which, as is known, are formed in abundance by the mineralized arc.

In place of collecting the fumes immediately in the neighborhood of the arc and at once sending them downward by means of the tubes, it may be well to subject them to a preliminary purification in condensing chambers placed above the partition which closes the upper portion of the globe. Fig. 2 for example shows an arrangement of this kind. The horizontal cover is replaced by a vessel 29, annular for example, through the center of which the fixed rods and the cross bars of the carbon carriers pass. This vessel 29 receives the fumes evolved by the arc after they have passed the reflector 30. In rising, the fumes pass between the baffles 31 and through filters 32 and wire gauze 33; the filters 32 may also, if desired, be formed of mineral substances as shown in Fig. 2, broken into fragments or into a coarse powder, capable of absorbing the nitrous vapors, such as the alkaline carbonates, etc. From the vessel 29 start one or more tubes such as 16, through which the gases are sucked by a fan, placed in the lower portion of the globe, as in Figs. 1 and 9, for example.

In certain cases it is more advantageous to arrange the system of tubes and the fan above and outside of the globe as shown in Fig. 3, the gases will then pass into condensing chambers placed above the box containing the mechanism.

In the arrangement shown in Fig. 3, one or more tubes such as 34 serve to draw the fumes upward on their passage out from the arc (which is surrounded by the reflectors 30) into a box 35 separated from the mechanism by an airtight partition 36. The fumes in the box first circulate between the baffles 37 and then pass through filters 38

containing if desired mineral substances 39 which absorb nitrous vapors. Suction is caused by a fan 40 driven by an electric motor 41 arranged above the box 35; at their outlet from the fan, the purified gases are led by one or more tubes, such as 42, inside the globe beneath the arc through a sleeve 24 surrounding the lower electrode, as in Fig. 1.

In order to simplify Figs. 1, 2, 3 and 9, there is only one suction pipe (16, 34) and one return pipe (17, 42) is shown, but in general, for reasons of symmetry and in order to avoid displacing the arc to one side or the other by a current of air, it is more advantageous to employ two or more suction pipes arranged symmetrically with respect to the axis of the carbons and two or more downward tubes also symmetrically arranged between the preceding. This does not in any way alter the principle of the invention. This arrangement is shown in Fig. 12. In the same manner, the fan 40 and the suction chambers 35 may be placed below the box containing the mechanism; but in general this arrangement presents a few more difficulties than the preceding because of the presence of the rods and chains of the carbon carriers; it is applicable preferably as shown in Figs. 4 and 5 in the case where a central condensing tube is used, for example when the upper carbon electrode is replaced by a fixed metal electrode. Fig. 4 shows an arrangement of this type: the metal or graphite electrode 43 which serves as a fixed positive or negative pole according to the arrangement employed, is supported at the center of a tube 44 situated above the arc and also central with respect to an airtight jacket 45; the lower portion of the electrode may or may not be surrounded by an economizer or reflector 46; the fumes pass through suitable orifices 47 into the central tube 44 (which may be provided with metal baffles 48, filters 49 or purifying mineral substances 50) through which they rise by reason of the suction of the fan 40 which is driven by its electric motor 41; the fumes now again pass downward (if desired through other filters such as 51, through separate tubes or through an annular space comprised between 44 and 45) and enter inside the globe through an orifice 24 situated near to the arc. In this arrangement the lower electrode 7 which is alone movable, is controlled by a rod 52 protected throughout by an airtight sheath 53 in such a manner that it cannot be exposed to the action of the fumes.

The central tube arrangement may also be combined with a fan placed beneath the globe, as shown in Fig. 5, in which the fan 54 is arranged substantially as in Fig. 1. The fumes rise through the tube 44 (which serves at the same time to condense and purify the gases) and again pass downward through the tube 55, traversing the electrically driven fan 54 and finish by condensing in the deposit box 56 and are led to the orifice 24 through the pipe 57. In this figure, as in all the preceding, the downward tubes may themselves be filled with baffles, filters, metal gauze or purifying substances for the physical or chemical cleaning of the gases. Lastly the space surrounding the gases circulating in the arc may be closed by a cup 58 of glass or other transparent substance, as shown in Fig. 3, thus limiting the volume of oxygen which can attack the electrodes when the arc is first lighted.

Fig. 6 shows another arrangement for returning the dirty gases into the arc. For this purpose the tubes which return these gases from the condensing chamber (for example the tube 57 in Fig. 5) are replaced by a flexible union 59 which terminates around the lower end of the carbon 7; this carbon is provided with a longitudinal hole, through which the gases escape directly into the arc.

In all the preceding it has been supposed that a fan is employed, but in certain cases it may to a certain degree be dispensed with by greatly increasing the cooling surface of the condensing chambers and by arranging in the interior a partition very opaque to heat. Fig. 7 shows an arrangement of this type. The condensing chamber 29 is greatly increased in height, and the filtering arrangements are dispensed with, in order that there may be no obstacle to the circulation of the gases; for the purpose of cleaning the chamber 29, the baffles 31 may be removed from beneath at the same time as the tubes 16 leading the gases downward although the chamber is fixed to the lamp and fills so to speak a portion of the space contained in the globe.

Fig. 12 is a modification of Fig. 11 showing two pairs of pipes for conducting the gases downwardly and upwardly respectively. As before, gases are led from around the arc by one or more connecting tubes opening out to an annular orifice 24 or to a flexible union as shown in Fig. 6.

Having thus fully described my invention, what I claim is:

1. In an arc lamp of the character described, the combination with the electrodes between which the arc is formed, and the inclosing globe, of a conduit in which the gases circulate and deposit solid products of combustion, said conduit having an opening above the arc to receive the gases and an exit below the arc to return the gases whereby the gases circulate without coming into contact with the inclosing globe.

2. In an arc lamp, the combination with the electrodes between which the arc is formed, of a substantially air tight trans-

parent or translucent envelop for said arc, of a conduit for the gases evolved at the arc, leading from a point above the arc to a point below the arc, in which the gases are confined, whereby said gases circulate without coming into contact with the walls of said envelop.

3. In an arc lamp of the character described, the combination with the electrodes between which the arc is formed, and the inclosing globe; of purifying means, and means for conducting the gases from the arc through the purifying means and back to the arc and preventing them from coming in contact with said inclosing globe.

4. In an arc lamp of the character described, the combination with the electrodes between which the arc is formed, and the inclosing globe; of purifying means, and a conduit including said purifying means, said conduit separate and distinct from said inclosing globe and having its inlet and discharge ends in the immediate vicinity of the arc, whereby the gases from the arc are conducted through the purifying means and returned to the arc, and isolated from the inclosing globe.

5. In an arc lamp of the character described, the combination with the electrodes between which the arc is formed and the inclosing globe; of purifying means, mechanical circulating means, and a conduit including said purifying means, said conduit being separate and distinct from said inclosing globe and having its inlet and discharge ends in the immediate vicinity of the arc whereby the gases from the arc are conducted through the purifying means and returned to the arc and isolated from the inclosing globe.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

ANDRÉ BLONDEL.

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FRANK H. MASON.