No. 739,977. PATENTED SEPT. 29, 1903.

A. BLONDEL.

ELECTRIC ARC LAMP.

APPLICATION FILED MAR. 26, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 6.

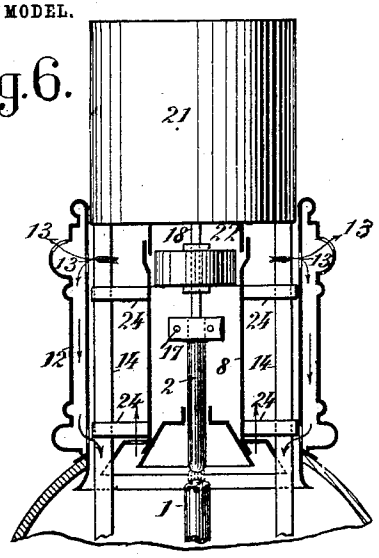


Fig. 8.

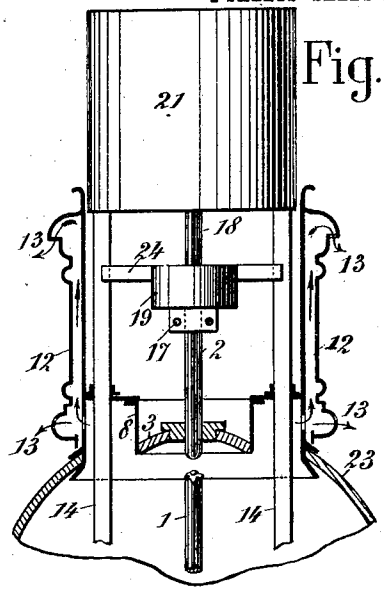


Fig. 1.

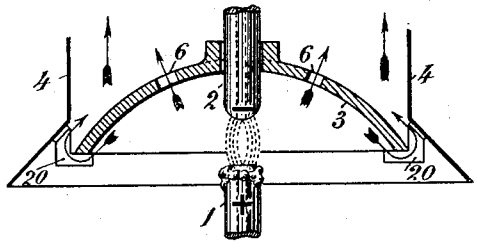
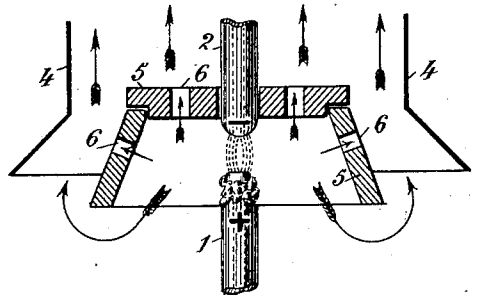


Fig. 2.



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A. BLONDEL.

ELECTRIC ARC LAMP.

APPLICATION FILED MAR. 26, 1902.

NO MODEL. 2 SHEETS—SHEET 2.

Fig. 4.

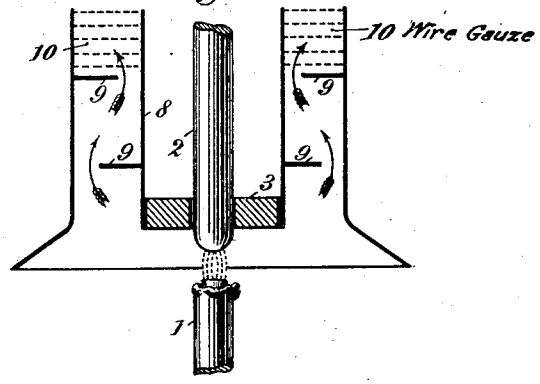


Fig. 3.

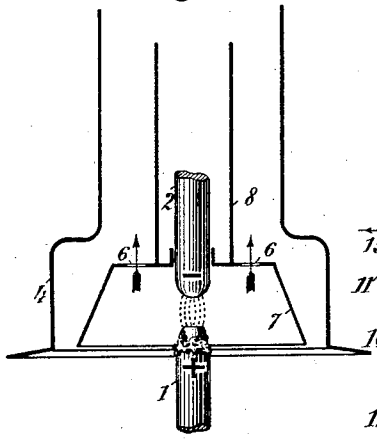


Fig. 5.

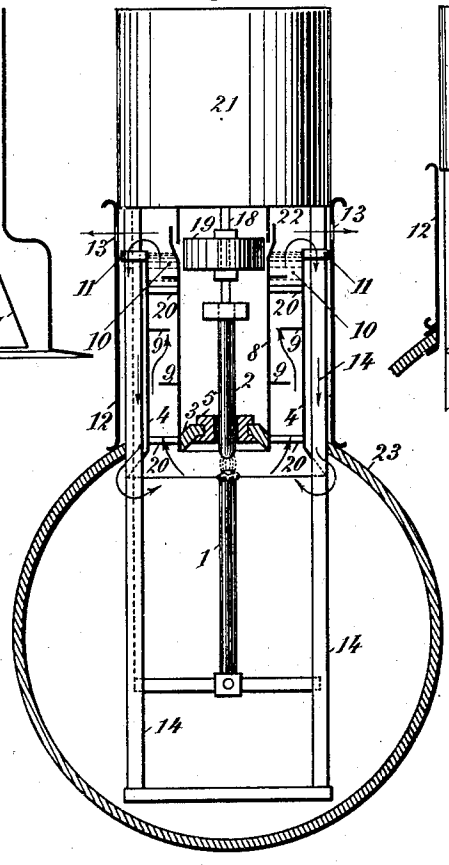
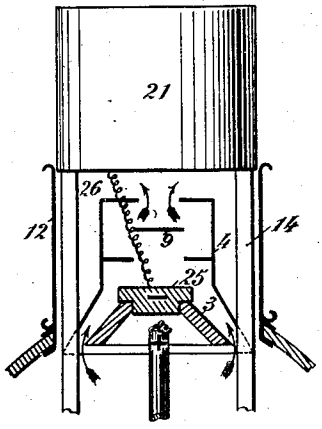


Fig. 7.



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No. 739,977. Patented September 29, 1903.

UNITED STATES PATENT OFFICE.

ANDRÉ BLONDEL, OF PARIS, FRANCE.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 739,977, dated September 29, 1903.

Application filed March 26, 1902. Serial No. 100,024. (No model.)

To all whom it may concern:

Be it known that I, ANDRÉ BLONDEL, a citizen of the Republic of France, residing at Paris, France, have invented certain new and useful Improvements in Arc-Lamps, of which the following is a specification.

My invention has relation to an electric-arc lamp of the type or class wherein one or both of the carbons is or are combined with light-producing salts; and in such connection it relates to the construction and arrangement of the parts of the lamp whereby the composite carbons can be economically and advantageously employed.

Heretofore it was known that the luminosity of highly-incandescent carbons could be increased if the carbon is mixed with salts of lime, magnesia, or similar minerals. However, in the use of such carbons it has been found that certain disadvantages due to the nature of the carbon were present—namely, the production of melted scoria, the diffusion of vapors and smoke, and the unsteadiness of the light.

The principal objects of my present invention are, first, to provide in an electric-arc lamp two vertically-arranged carbons, one, the lower and positive carbon, being mixed with the light-producing salts, and the other, the upper electrode, either of carbon combined with a small percentage of these salts or of pure carbon and the upper carbon provided with a refractory shield or plate encircling the carbon above the arc formed between the carbons; second, to provide in an electric-arc lamp, in addition to the two carbons and the refractory shield or plate upon one of said carbons, a smoke-consumer or draft-passage located concentrically with the carbon upon which the refractory shield or plate is arranged, and, third, to provide in an electric-arc lamp, wherein a composite carbon is opposed to a substantially pure carbon, a combined means for preventing the accumulation of scoria upon the carbons and the diffusion of smoke and vapors about the luminous center of the lamp, as well as for securing an increase in the luminosity of the arc by refraction.

The nature and scope of my 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 vertical sectional view illustrating diagrammatically the carbons, refractory shield, and smoke-conveyer embodying main features of my invention. Figs. 2, 3, and 4 are views similar to Fig. 1, but each illustrating a modified form of the invention. Fig. 5 is a vertical sectional view, partly in elevation, of a lamp wherein the invention is embodied in a still further modified form; and Figs. 6, 7, and 8 are views similar to Fig. 5, but each illustrating a still further modified arrangement of carbons, refractory shield, and smoke-conveyer.

Referring to the drawings, and particularly to Fig. 1, the lower carbon 1 is preferably the positive electrode of a continuous-current lamp, and as such it consists of carbon mixed with the light-producing salts either in block or having a core of such composite carbon surrounded by pure carbon. This lower carbon 1 in an alternating current is the alternative electrode. The upper carbon 2 is preferably the negative electrode of a continuous-current lamp, and as such it is essentially of pure carbon with a slight percentage of the light-producing salts either in block or in its core. It may, if desired, be formed of pure carbon with a composite covering. In alternating-current lamps this carbon 2 is an alternative electrode. Upon this upper or negative carbon 2 is arranged a shield or plate 3, of refractory material or metal. This shield or plate may be of any preferred shape or form, as illustrated in the various figures of the drawings, so long as it accomplishes the twofold function or purpose of protecting the upper carbon 2 from vapors arising from the arc by condensing said vapors on its under surface, as well as reflecting the light from above the arc downward from that surface upon which the vapors are condensed. In Fig. 1 the plate or shield 3 is spherical and is provided with openings 6, through which those vapors may escape which are not condensed upon the shield or plate. Concentric with the rim or lower edge of the plate or shield 3 is a tube 4, having a lower flaring or conical edge extending, preferably, below the shield or plate 3. This tube 4 forms a flue or chimney into which the smoke is drawn upward, as indicated by

the arrows. The tube 4 also forms, preferably, the support for the plate or shield 3, having for this purpose the brackets or claws 20, on which the lower edge or rim of the plate or shield 3 rests.

In Fig. 2 the construction is substantially the same as in Fig. 1 with the exception that in this form the refractory plate or shield 5 is cup-shaped and inverted over the arc formed between the carbons 1 and 2. The base and conical walls of the cup-shaped plate or shield 5 are both perforated, as at 6, to permit the escape of the vapors to the interior of the tube 4.

In Fig. 3 the shield or plate 7 is of inverted-cup shape, as in Fig. 2; but in this form of the device a tube 8, concentric with the upper carbon 2, projects from the roof of the shield 7 and surrounds the carbon 2 to protect it from the smoke and vapors in the smoke-conveyer 4, which surrounds the tube 8.

In Fig. 4 the shield 3 is flat and arranged at the base of the tube 8. Between the tube 8 and the encircling smoke-conveying tube 4 are arranged baffle-plates 9 and wire-gauze 10, through which the smoke and vapors must pass to facilitate the deposit of soot from the smoke.

In Fig. 5 the general arrangement of a lamp is illustrated. In this figure the shield or plate 3 projects downward from a collar 5, secured to the carbon 2, and is inclosed by the tube 8, which protects the carbon 2 from the smoke and vapors in the conveyer 4. The conveyer-tube 4 has claws or brackets 11 encircling the vertical supporting-tubes 14 of the lamp and are adapted to slide thereon to form a means for elevating or lowering the conveyer 4 with respect to the arc between the carbons 1 and 2. The holder 15 for the lower carbon 1 consists of a cross-bar sliding in the tubes 14. Through one of said tubes 14 extends a chain 16, connecting the feeding mechanism (not shown) with the lower-carbon holder 15. The smoke-conveyer 4 is surrounded by the casing 12 of the lamp and is by preference perforated, as at 13, above the discharge from said conveyer 14. The rod 18 of the upper-carbon holder 17 is operated by a feeding mechanism, (not shown,) and to the rod 18 is secured a counterweight 19, both weight 19, carbon-holder, and upper carbon 2 sliding up and down in the protective tube 8. The conveyer-tube 4 supports the protective tube 8 through the intermediary of claws or brackets 20. The feeding mechanism for the carbons 1 and 2 is inclosed in the casing or shell 21. The tubes 8 and 4 slide up and down, as before explained, upon the supporting-tubes 14 of the lamp, and when an upper carbon 2 is to be replaced both tubes 4 and 8 are lowered sufficiently to permit of access to the carbon 2 and its holder 17. A short tube 22 serves to close the upper end of the protective tube 8 when the same is elevated into operative position. A globe 23 incloses the arc between the two carbons.

In Fig. 6 the construction is similar to that illustrated in Fig. 5 with the exception that the smoke-conveyer consists of the casing or shell 12 of the lamp.

In Fig. 7 the principal difference between the modification shown and the modifications of the other figures consists in replacing the upper negative carbon 2 by a block 25 of pure or substantially pure carbon or of refractory material mixed with carbon and with a metal. In this form, 26 represents the conductor leading the current to the negative pole or block 25.

In Fig. 8 a still further modification of the lamp is illustrated, wherein the protecting-tube around the upper carbon is dispensed with. In this form, however, the space wherein the carbon 2 slides is inclosed by the casing 12, the casing 21 and the shield or plate 3, supplemented by the tubular extension 8, and plate 27 on said shield or plate 3. In this form the passage for the escape of smoke or vapors is formed in the casing 12, having outlets 13.

The advantages of the above-described arrangement are many. By placing the composite positive carbon below the upper and negative carbon a curious phenomenon arises, which explains why but small results were obtained heretofore from continuous-current arcs in which the composite alternative or positive carbon was arranged above the negative carbon. As is well known, the luminous mineral vapors have a tendency to rise and to separate themselves from the carbon or smoke vapors when the current flows from the upper to the lower carbon. The arc in this instance is luminous only in its upper part near the upper carbon. When, however, the composite carbon is placed below the upper negative carbon, the ascending current heats the luminous vapors during the whole of their course, and when assisted by the shield or plate 3 this results in an increase of the total luminous flux of from twenty-five to forty per cent. in similar lamps and from one hundred to three hundred per cent. in other arc-lamps. Again, when the composite carbon is placed below it is no longer licked by the flame, and hence produces less scoria. The scoria produced runs off the carbon without falling into the arc. The upper carbon being substantially pure produces no troublesome globules of scoria.

To increase the steadiness of the light, it is preferable in alternating-current lamps to place in both carbons a core containing alkaline salts, such as tartrates, carbonates, &c., of sodium or potassium, &c. The combining of a small percentage of light-producing salts with the carbon of the upper electrode is of little value in continuous-current lamps except perhaps in reducing the consumption of the upper carbon. In alternating-current

lamps, however, the combining of each carbon with the light-producing salts assists in increasing the luminosity of the arc. In such instances the lower carbon should contain from thirty to sixty per cent. of mineral substance, whereas the upper carbon should contain from but five to twenty per cent. of the salts of lime, &c., or a core of large diameter containing a considerable quantity of this substance. In any case the special feature is a composite lower carbon. In addition to the advantages arising from the composition and arrangement of the two carbons the shield or plate around the upper carbon above the arc has several useful advantages. Thus it protects the upper carbon from the action of the flame, the ordinary function of a shield. Again, it condenses on its under surface adjacent to the arc a large proportion of the mineral vapors, which form upon the shield or plate a white reflecting coating or layer. Being of refractory material and having a reflecting surface, the employment of such a shield corrects any appreciable loss of light which might result from placing in continuous-current lamps the positive carbon below the negative carbon, and the effective luminous flux still remains from twenty-five to forty per cent. greater than if in a reverse arrangement of the electrodes, even if a shield is used in such reverse arrangement. Its reflecting-surface renders the light uniform by diffusing nearly the same quantity at all times in all directions in spite of the displacement of the arc around the carbons. Again, the shield or plate places the arc so that it is protected against cooling and currents of air, holds back the vapors, and renders the arc steadier. Thus, with this arrangement and the carbons arranged in the manner indicated above, steady arcs of ten to twenty-five millimeters and more, under tensions of thirty to fifty volts and beyond this, may be formed, thus obtaining the maximum useful effect.

The smoke-consumer, which may be dispensed with in certain cases, consists substantially in a conical or cylindrical flue or chimney surrounding the shield or plate, so as to collect and carry upward by suction through the action of a draft the mineral vapors which escape from it by the lower rims. Holes may also be pierced in the shield or plate, for facilitating this outlet of the vapors; but the chimney produces a useful effect, which would not be obtained by holes alone without chimneys. The smoke-consumer may vary in height or be reduced to a simple collar. It may be employed at the same time as an outer covering for the lamp, Fig. 6.

In general it is an advantage to attach it to the interior cylindrical or conical protecting-tube which supports the shield or plate and surrounds the upper carbon, so as to place it beyond the reach of the air or the vapors. The vapors are drawn up into the circular space or flue comprised between the two tubes and can be caused to deposit themselves here almost entirely by means of baffle-plates or wire-gauze.

It will be observed that the mechanism contained in the casing box or shell 21 in Figs. 5, 6, 7, and 8 is completely isolated from the mineral vapors. This mechanism may be of any kind upon condition of its satisfying two requirements—viz., insuring a much greater extension of the electric arc than in ordinary lamps and giving the upper carbon a forward motion proportional to the extent to which it is worn out, which in general takes place less quickly than in ordinary continuous-current lamps, in which the positive carbon is above.

The arrangements described are capable of a number of modifications which do not alter the essential characteristics described above. In particular the smoke-consumer may be plain or enameled, as a reflector. It may have a great variety of forms, as may also the shield or plate. The substance of which this latter is composed may also be considerably varied. The baffle-plates may be cylindrical or conical, or be dispensed with, as in Fig. 6, or, again, chambers for condensing vapor may be placed outside in the covering 12, into which the gases are conveyed for the purpose of condensing them, as shown by Figs. 6 and 8. Likewise the shield or plate may be made according to circumstances of plain or enameled metal, porcelain, refractory earth, carbon, lime, magnesia, &c., or a mixture of these substances. The carbons themselves may be formed of a very large core containing a considerable quantity of salts of lime, magnesia, &c., in place of being treated so in the block.

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

1. In an electric-arc lamp, a lower electrode, comprising carbon combined with light-producing salts, an upper electrode and a shield or plate located around the upper electrode above the arc formed between said electrodes.

2. In an electric-arc lamp, a lower electrode formed of carbon combined with light-producing salts, an upper electrode, and a shield or plate of refractory material located on said upper electrode above the arc formed between said electrodes, said shield or plate having a surface to receive and condense the mineral vapors arising from the arc.

3. In an electric-arc lamp, a lower electrode consisting of a pencil of combined carbon and light-producing salts and an upper electrode formed of a block of carbon or carbon composition, said upper electrode having an under surface for the reception and condensation of the mineral vapors arising from the arc between the electrodes.

4. In an electric-arc lamp, a lower electrode formed of carbon combined with light-producing salts, an upper electrode formed of a block of refractory carbon composition and a shield forming an extension of the upper electrode, said upper electrode and shield having a surface for the reception and condensation of

the mineral vapors arising from the arc between the upper and lower electrodes.

5. In an electric-arc lamp, a lower electrode formed of carbon combined with light-producing salts, an upper electrode, a shield or plate located around said upper electrode adjacent to the arc formed between the electrodes and having a surface for the reception and condensation of mineral vapors arising from said arc, and a protecting-tube extending upward from said shield or plate and inclosing the upper electrode.

6. In an electric-arc lamp, a lower electrode formed of carbon combined with light-producing salts, an upper electrode, a shield or plate located around said upper electrode adjacent to the arc formed between the two electrodes, and a smoke-conveyer surrounding the upper electrode and shield or plate and having an inlet adjacent to the arc formed between said electrodes.

7. In an electric-arc lamp, a lower electrode formed of carbon combined with light-producing salts, an upper electrode, a shield or plate located around said upper electrode adjacent to the arc formed between said electrodes, a tube surrounding the upper electrode and located above the shield or plate, and a smoke-conveyer surrounding said tube and shield or plate and having an inlet adjacent to the arc formed between the two electrodes.

8. An electric-arc lamp with electrodes partly composed of metal, and in which the negative electrode is above the positive, and the lower or positive electrode contains at least five per cent. and the upper or negative one less that five per cent. of metal, for the purpose of lessening the formation of the slag at the negative electrodes, preventing the falling of slag on the positive electrode, and increasing the length of the arc.

9. An arc-lamp, with electrodes partly composed of metal, and in which the negative electrode is above the positive and the lower or positive electrode contains at least five per cent. of metal and the upper or negative one less than five per cent. with an annular reflector, which surrounds the upper electrode, close to the arc, for the purpose of preventing the arc from being blown aside and upward, and thereby of steadying the arc.

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

ANDRÉ BLONDEL.

Witnesses:
C. MATHIEUY,
J. ALLISON BOWEN.