

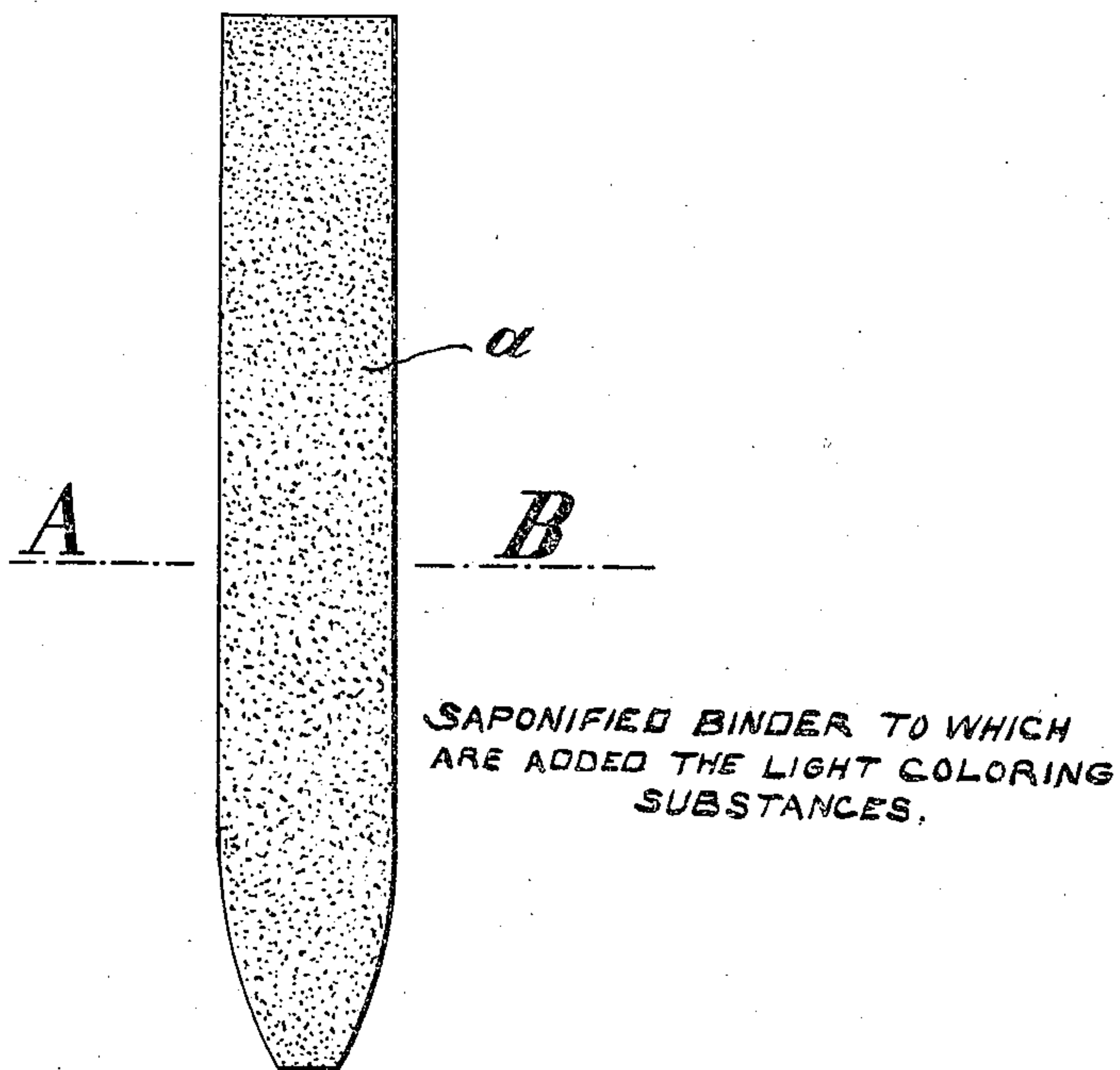
No. 769,003.

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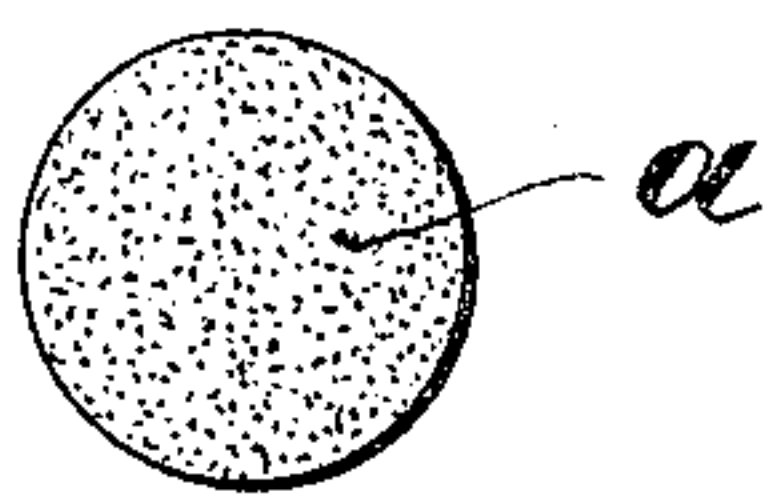
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MANUFACTURE OF ELECTRODES OF ARC LAMPS.  
APPLICATION FILED MAR. 3, 1903.

NO MODEL.

*Fig. 1.*



*Fig. 2.*



Witnesses:  
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By his Attorneys.  
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## UNITED STATES PATENT OFFICE.

MAURICE LILIENFELD, OF BERLIN, GERMANY.

## MANUFACTURE OF ELECTRODES OF ARC-LAMPS.

SPECIFICATION forming part of Letters Patent No. 769,003, dated August 30, 1904.

Application filed March 3, 1903. Serial No. 145,989. (No model.)

*To all whom it may concern:*

Be it known that I, MAURICE LILIENFELD, of Berlin, Germany, have invented certain new and useful Improvements in the Manufacture of Electrodes of Arc-Lamps; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form part of this specification.

It is known that the luminosity of electrical arc-lamps can be increased by mixing with the powdered carbon employed in the production of the electrodes certain substances—such as pulverulent metals, metal salts, oxids, and the like—which emit an intense and in some cases a colored light in the flame of the arc and forming the electrodes from the mixture or by impregnating the prepared electrodes with solutions of such substances. Such additions prejudice the steady and uniform combustion of the arc, and, more especially with the usual high-percentage additions, the separation of the scoria, increased resistance of the electrode due to these conditions, and the like are reasons causing a disturbing effect on the formation and maintenance of the arc and generally require a special construction of lamp. As has been ascertained by my experiments these disadvantages consequent to the use of so-called “effect-carbons” (to wit, carbons intended to give a colored or peculiarly intense light) arise to only a slight extent when the luminiferous or tinting or coloring materials are very uniformly distributed throughout the electrode and are united closely with the carbon particles. In the course of these experiments effect-electrodes were produced by a process consisting as opposed to the present method (of incorporating the luminiferous substances with the carbonaceous powder from which the electrode is pressed) in adding to and intimately mixing the said substances with the agent employed for binding the powdered carbon. This can be effected both by chemical and mechanical methods. The former consists in mixing with the tar, resin, or pitch employed as a binding agent, alkali, alkaline earth, or metal oxid or hydroxid—such as sodium hydrate, calcium hydrate, or the like—

and saponifying by heat. The tar is naturally only partially saponified, and in this way a very uniformly-distributed chemical combination of the luminiferous substances with the binding agent is produced in the binding agent itself, or, for example, by saponifying resin with chalk a resin alkali soap is produced and is mixed with the tar or pitch either at ordinary temperature or heated to bring it to the consistency of a thin liquid. The other, the mechanical way, consists in heating the binding agent until it has reached the temperature of its maximum fluidity and mixing therewith substances which have no affinity for the binding agent, but intensify or color the light emitted by the electrodes—such as metals, fluorids, chlorids, borates, borids, silicates, silicides, carbids, boric acid, and the like—the mixture being stirred and even further heated until a homogeneous mass results, which after being cooled in the usual manner serves as a binding agent, or the above-mentioned substances may be added to the binding agent at ordinary temperature.

If the binding agent contains a small proportion of constituents, such as form a chemical combination with the additions, it is advantageous to unite the methods and to add to the binding agent during, before, or after the saponification the inactive materials and forming the pencils or mixing the altered binding agent with a suitable portion of an unaltered binding agent and then forming the pencils. Another way consists in producing a chemical compound by heating the binding agent with oxids, hydrates, carbonates, or other active salts or compounds of metals and mixing then the thus-obtained compound with a suitable quantity of chemically-unaltered binding agent which has been previously intimately mixed with other luminiferous salts which are chemically non-active with respect thereto.

Adapted to one of the usual methods of production of such electrodes the process is carried out as follows: The tar, resin, or pitch to be employed as a binding agent is mixed and heated so as to produce a chemical compound with a suitable oxid or hydroxid of alkali or alkaline earth, such as calcium hydrate,



which emits light in the electric arc. The quantity of the addition depends upon the quantity of saponifying constituents in the binding agent. The resulting compound is  
5 with or without the addition of suitable quantities of other luminiferous materials, such as fluor-spar metal or the like, which are intimately mixed with the tar-calcium compound, mixed in the usual way with finely-ground  
10 retort-carbon, black graphite, lampblack, petroleum-soot or the like, shaped and burned *in vacuo*, and then, if necessary, finally ground and formed into carbon pencils.

The advantages which these processes possess over what is known are that first the binding power of the tar or resin compounds, especially of the alkali and alkaline-earth compounds of tar, is much greater than that of tar alone, so that firm electrodes are obtained,  
20 which besides are penetrated uniformly throughout their mass by the mixture, which latter embraces the particles of carbon closely, so that no considerable increase of resistance is brought about, and, further, as has been  
25 ascertained, only small percentages of the additions suffice to obtain an output of light equal to that obtained at present with proportionately-large quantities of such additions, (fifty per cent. and more.) Accordingly, the  
30 quantity of scoria is smaller.

It is obvious that under this process, according as is desired, all possible additions—such as metals, metalloids, or their salts and compounds—may be employed.

35 In the accompanying drawings, Figure 1 represents an electrode for arc-lights manufactured according to my invention and indicating the homogeneous nature of the product. Fig. 2 is a cross-section thereof on line A B,  
40 Fig. 1.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. Process for producing electrodes of arc-lamps consisting in mixing with the binding  
45 agent luminiferous and light-coloring substances heating the mixture while stirring to bring the binding agent to the consistency of a thin liquid and forming the electrodes from the product thus obtained in admixture with  
50 powdered carbon substantially as described.

2. Process for producing electrodes of arc-lamps consisting in mixing the binding agent with luminiferous substances chemically active thereon heating the mixture until chemical  
55 combination takes place and forming the electrodes from the product in admixture with powdered carbon substantially as described.

3. Process for producing electrodes of arc-lamps consisting in mixing the binding agent with luminiferous substances chemically active thereon heating the mixture until chemical  
60 combination takes place mixing the product thus obtained with suitable quantities of

chemically-unaltered binding agent and forming the electrodes from the mixture and powdered carbon substantially as described. 65

4. Process for producing electrodes of arc-lamps consisting in mixing the binding agent with luminiferous substances chemically active thereon heating the mixture until chemical  
70 combination takes place mixing the product thus obtained with suitable quantities of chemically-unaltered binding agent heating the mixture while stirring and forming electrodes from the product thus obtained and  
75 powdered carbon substantially as described.

5. Process for producing electrodes of arc-lamps consisting in mixing the binding agent with chemically-non-active luminiferous and  
80 light-coloring substances then heating the mixture with another portion of chemically-active luminiferous substances while stirring so as to produce a chemical combination and forming electrodes from the product thus obtained and powdered carbon substantially as  
85 described.

6. Process for producing electrodes of arc-lamps consisting in mixing the binding agent with chemically-active and non-active luminiferous and light-coloring substances heating the mixture while stirring so as to produce  
90 a chemical combination between the binding agent and the chemically-active luminiferous and light-coloring substances and forming the electrodes from the product thus obtained with admixture of powdered carbon substantially as described. 95

7. Process for producing electrodes of arc-lamps consisting in heating the binding agent with chemically-active luminiferous and light-coloring substances mixing the produced combination with suitable quantities of other  
100 thereto chemically-inactive substances and then forming the electrodes from the product thus obtained in admixture with powdered carbon substantially as described. 105

8. Process for producing electrodes of arc-lamps consisting in mixing the binding agent with chemically-non-active luminiferous and  
110 light-coloring substances then heating the mixture with another portion of chemically-active luminiferous substances while stirring so as to produce a chemical combination mixing the product thus obtained with suitable  
115 quantities of chemically-unaltered binding agent and forming the electrodes from the mixture and powdered carbon substantially as described.

9. Process for producing electrodes of arc-lamps consisting in mixing the binding agent with chemically active and non-active luminiferous and light-coloring substances heating the mixture while stirring so as to produce a  
120 chemical combination between the binding agent and the chemically-active luminiferous and light-coloring substances mixing the product thus obtained with suitable quantities 125



of chemically-unaltered binding agent and forming the electrodes from the mixture and powdered carbon substantially as described.

10. Process for producing electrodes of arc-  
5 lamps consisting in heating the binding agent with chemically-active luminiferous and light-coloring substances mixing the produced combination with suitable quantities of other thereto chemically-inactive substances, mixing  
10 the product thus obtained with suitable quantities of chemically-unaltered binding

agent and forming the electrodes from the mixture and powdered carbon substantially as described.

In testimony that I claim the foregoing as  
my own I affix my signature in presence of two  
witnesses.

MAURICE LILIENFELD.

In presence of—

L. U. REDDIE,  
HUGO MATSON.