J. T. H. DEMPSTER.

ARC LIGHT ELECTRODE AND METHOD OF MAKING THE SAME.

APPLICATION FILED MAR. 26, 1903.

1,041,752. Patented Oct. 22, 1912.

Fig. 2.

Fig. 1.

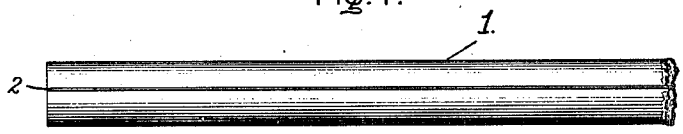


Fig. 3.

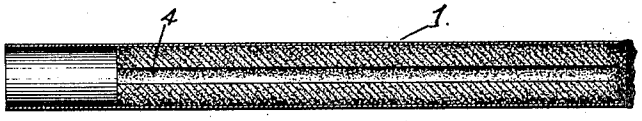
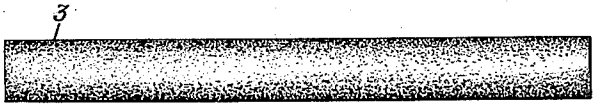


Fig. 4.



Witnesses.

George H. Tilden.

Helen Orford

Inventor.

John T. H. Dempster.

by Albert G. Davis

Att'y.

UNITED STATES PATENT OFFICE.

JOHN T. H. DEMPSTER, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ARC-LIGHT ELECTRODE AND METHOD OF MAKING THE SAME.

1,041,752. Specification of Letters Patent. Patented Oct. 22, 1912.

Application filed March 26, 1903. Serial No. 149,641.

To all whom it may concern:

Be it known that I, JOHN T. H. DEMPSTER, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Arc-Light Electrodes and Methods of Making the Same, of which the following is a specification.

The object of my invention is the production of an electrode for use in arc lights which possesses good light-giving qualities and a good mechanical construction.

More particularly my invention relates to electrodes giving a luminous arc, that is, electrodes in which a large proportion at least of the light radiation is from the arc itself.

In the preferred form of my invention an iron tube or shell has forced into it a core formed principally of an oxid or oxids of iron. In preparing the core for these electrodes I employ a mixture containing about eighty per cent. of magnetic oxid Fe_3O_4; about eighteen per cent. of the red oxid of iron Fe_2O_3; and about two per cent. of some substance or substances which will lower the melting point of the mixture. The substances which I have found most advantageous for this purpose are potassium titanate K_2TiO_3 and potassium hydrate KOH. These materials are powdered and worked together dry to form an intimate mixture. The mixture is then moistened sufficiently to render it plastic so that it can be molded. Preferably to the water with which the powder is moistened I add about five per cent. of some fluid which does not evaporate so readily as water. The fluid which I ordinarily employ for this purpose is glycerin. The plastic material is then molded into a pencil. Any suitable method may be employed in molding these pencils. The method which I ordinarily employ is that which is called "squirting" in which the plastic material is forced through a tubular die by hydraulic pressure. After molding the pencils they are dried in air for a suitable period which may be about twenty-four hours. They are then baked in air for another period of about twenty-four hours, being gradually brought up to a temperature of about 200° C. at the end of that time. This effectually drives off the water and glycerin. The glycerin which is added to the fluid with which the material is moistened tends to hold the mass together until the material is set and prevents the crumbling which is otherwise apt to occur in a comparatively short time after the electrode begins to dry. After the baking hereinbefore described, the pencils are packed in crucibles, being surrounded with granular material such as magnesium oxid, flint, or red oxid of iron. The crucibles are then placed in a muffle furnace which is gradually brought up to a temperature of about 1200° C. This temperature is maintained for a period of about an hour, after which the crucible is gradually cooled off. The effect of this last heating is to convert the red oxid of iron, which is unstable at the temperature employed, into the magnetic oxid of iron, the excess of oxygen being freed and driven off. The packing which surrounds the electrodes in this heating action prevents any other reducing action than that named from taking place. It also prevents any sagging or other distortion in the shape of the pencils from taking place. The pencils when cooled are found to be quite strong and hard and contain but very small quantities of air. Owing to their granular nature however they are but poor conductors, as the temperature to which they have been subjected is insufficient to cause them to flow together. The red oxid of iron is added to the magnetic oxid owing to the fact that the combined mixture is more easily molded into a homogeneous mass than is the magnetic oxid when used alone. After the pencils cool down they may be rubbed slightly with emery paper or the like if necessary to smooth them, and are then forced into thin tubes or shells of iron. One end of the tube thus formed is treated to make it conductive. A simple method of treating it for this purpose consists in fusing it over in the electric arc. The electrode is then finished and is ready for use. The electrode consisting of a metal tube and pencil filling therefor is especially advantageous owing to the compactness and homogeneity of the pencil and the thoroughness with which it can be dried before insertion in the tube. If the temperature of the muffle furnace in which the electrodes are treated be raised somewhat above 1200° C., the granular material composing the pencils will flow together sufficiently to make the

pencils comparatively good conductors of electricity. When so treated, the pencils may be used as electrodes without incasing them in the iron tube. Unless, however, a considerable amount of care is exercised in preparing the electrodes in this manner, they are liable to be defective by reason of the blisters and other distortions in their shape produced in heating them to such a temperature.

In the accompanying drawings Figure 1 is an elevation showing the completed electrode; Fig. 2 is an end view showing the fused end; Fig. 3 is a sectional elevation of the completed electrode; and Fig. 4 is an elevation showing the pencil before insertion in the tube.

Referring to the drawings, 1 represents a shell or tube of sheet metal which may be formed out of a strip the parallel long edges of which may be united in any suitable manner at 2 as by a tinner's seam. The pencil formed in the manner hereinbefore described shown at 3 is forced into this tube, the parts being so proportioned that a tight fit is obtained. In practice the iron tube may be somewhat longer than the pencil as shown in Fig. 3, there being no necessity for filling with the pencil that part of the tube which is held in the current-carrying clamp or holder, as it is ordinarily thrown away when the electrode is consumed to that point. The pencil may be cored as indicated at 4, although ordinarily I do not prefer this construction. The end of the electrode after fusing has the appearance indicated at 5. If the fused end of the electrode should be knocked off or otherwise removed, the electrode would not be seriously damaged as there is no liability of the pencil escaping from the tube and the end of the electrode can be readily fused over again.

In operation the metallic iron forming the shell fuses together with the iron oxids forming the pencil, and the material thus fused slowly vaporizes, giving a highly luminous arc. The potassium titanate or hydrate or other similar substance which is mixed with the other ingredients of the pencil reduces the fusing and vaporizing points somewhat, and thereby increases the material which is vaporized upon the passage of a given current. This tends to increase the volume of the arc and to steady the arc in operation.

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

1. The method of facilitating the shaping of electrodes composed principally of magnetic oxid of iron, which consists in adding a comparatively small portion of red oxid of iron to the magnetic oxid of iron prior to the shaping.

2. The method of facilitating the shaping of electrodes composed principally of the magnetic oxid of iron, which consists in adding red oxid of iron and a suitable binding material to the magnetic oxid of iron prior to the shaping of the electrode.

3. The method of treating electrodes consisting mainly of iron and oxygen chemically combined, which consists in placing them in a granular mass of non-reducing material and then baking them.

4. The method which consists in forming a mixture composed principally of iron and oxygen chemically combined, molding into pencils, forcing the pencils into iron shells, and then treating the arcing end of the inclosed pencil to increase its conductivity.

5. The method of producing a pencil composed principally of magnetite, which consists in mixing together magnetite with a red oxid of iron, treating the mixture to make it plastic, molding the plastic material into pencils, and then converting the red oxid of iron into magnetite.

6. The method which consists in forming electrode pencils from a mixture containing magnetic oxid of iron and red oxid of iron, and then converting the red oxid of iron into the magnetic oxid of iron.

7. The method which consists in forming electrode pencils from a mixture containing two oxids of iron, then heating the mixture to convert it into one oxid of iron.

8. The method which consists of forming a mixture of red oxid of iron and the magnetic oxid of iron, moistening the mixture to render it plastic, molding the plastic material into pencils, and heating the pencils to convert the red oxid of iron contained therein into the magnetic oxid of iron.

9. The method which consists in forming a mixture containing red oxid of iron with magnetic oxid of iron, moistening the mixture to render it plastic, molding the plastic material into pencils, heating the pencils to convert the red oxid contained therein into the magnetic oxid of iron, and then inserting the pencil into an iron tube.

10. The method which consists in forming a mixture containing red oxid of iron and the magnetic oxid of iron, moistening the mixture to render it plastic, molding the plastic material into pencils, heating to convert the red oxid contained therein into the magnetic oxid of iron, inserting the pencils into an iron tube or shell, and then fusing one end of the tube and pencil together.

11. An arc light electrode consisting of an iron tube or shell filled with a pencil composed principally of iron and oxygen chemically combined, one end of the pencil and the tube being fused together to increase the conductivity of said end.

12. An arc light electrode composed principally of iron and oxygen chemically combined, and a small quantity of some other

substance which tends to lower the fusing point of the compound of iron and oxygen.

13. An arc light electrode consisting largely of iron and oxygen chemically combined to which is added a small quantity of a potassium salt.

14. An arc light electrode consisting mainly of iron and oxygen chemically combined to which is added a small quantity of potassium titanate.

15. An arc light electrode composed largely of a metal oxid giving a luminous arc, mixed with a substance which volatilizes at a lower temperature than said oxid.

16. An arc light electrode composed principally of iron oxid, but containing a substance which melts at a lower temperature than said oxid.

17. An arc light electrode metallic in composition, and containing a titanium salt.

18. An arc light electrode metallic in composition, and containing a salt which comprises both potassium and titanium.

In witness whereof, I have hereunto set my hand this 25th day of March, 1903.

JOHN T. H. DEMPSTER.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.