UNITED STATES PATENT OFFICE.

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ARC-LAMP ELECTRODE.

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To all whom it may concern:

Be it known that I, CHARLES FIELD, 3d, a citizen of the United States, residing at Lakewood, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Arc-Lamp Electrodes, of which the following is a full, clear, and exact description.

My invention relates to flaming and luminous arc lamp electrodes of either the solid or cored type, though it is particularly adapted to the former.

As is now well known, flaming and luminous arc lamps derive the greater part of their light from the arc itself, while the old type of carbon arc derives its light from the crater. In the flaming arc electrode, certain materials are placed therein which on passing into the arc render it highly luminous. These materials are either placed in the core of the electrode or homogeneously mixed with the rest of the materials of the lamp. The latter type has come to be known as a "solid flamer."

I have found that zirconium fluorid is an especially valuable flaming material for electrodes. More particularly is this true when used in the form of a double fluorid with potassium (K_2ZrF_6). Potassium salts are very efficient arc supporting materials, and I have found that zirconium fluorid makes a very white light of high candle power, therefore, the double fluorids of potassium and zirconium are especially valuable as flaming materials.

There are certain materials that render the arc highly luminous and have the proper color characteristics, but on account of their low boiling point, they cannot be used in solid flamers since such have to be baked in a furnace to a fairly high temperature. If these materials were placed in the electrodes, they would all be volatilized before the furnace bake was completed. These same materials, however, can be used in the core type of electrode, since such electrodes are only heated to a moderate temperature to dry out the binder. The candle power of the arc, however, increases with the temperature of the arc and materials of low boiling point have a tendency to keep the temperature of the arc down. Examples of materials that have too low boiling points to be successfully used in solid flamers are titanium fluorid (TiF_4) and titanium chlorid ($TiCl_4$). Zirconium fluorid on the contrary is a material of high boiling point and when used in the flaming mixture increases the temperature of the arc, and consequently its candle power. The double fluorid of potassium and zirconium also has a high melting point and the combination of the two fluorids, therefore, makes a valuable electrode constituent on account of the arc supporting characteristic of the potassium fluorid and the light producing quality of the zirconium fluorid.

Many materials, when tested in arc lamp electrodes, give a satisfactory light, but cannot be used on account of their tendency to slag. I have found that zirconium fluorid and potassium zirconium fluorid do not have this objectionable feature.

While I prefer to use potassium in combination with zirconium, sodium or other metals of the alkali group can be combined with zirconium as the double fluorid. I have also tried out and found that cerium zirconium fluorid is an especially good combination for a flaming mixture since the cerium is a very efficient flaming material. The other rare earth elements I have also found to be highly efficient when combined with zirconium as a double fluorid. These may be separated out or they may be used together. The rare earths are at present mostly obtained from what is known as "Welsbach residue," and their separation is a more or less expensive operation. For this reason it is often desirable to use the mixture of the rare earth elements in combination with the zirconium as double fluorids.

It will, of course, be understood that the salts which I have described previously will be mixed with a good conducting body to form the complete electrode. I prefer to use carbon as the conducting body on account of its well known desirable characteristics. It will, of course, be understood that other materials may be added such as the borates, tungstates, carbonates, etc., to round out the steadiness and candle power. I have found from tests of my electrodes that they not only have the desirable characteristics previously pointed out, but also that they considerably increase the life of the electrode. This increase is as much as ten per cent. and on account of this alone, the

use of the double fluorids mentioned are especially valuable.

Having described my invention, what I claim is:

1. In an arc lamp electrode, the combination of a conducting body with zirconium fluorid.

2. In an arc lamp electrode, the combination with a conducting body of potassium and zirconium fluorids.

3. In an arc lamp electrode, the combination with a conducting body of the double fluorid of potassium and zirconium.

4. In an arc lamp electrode the combination of carbon with the double fluorids of potassium and zirconium.

In testimony whereof, I hereunto affix my signature.

CHARLES FIELD, 3D.

Witnesses:
IRA J. ADAMS,
H. G. GROVER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."