

UNITED STATES PATENT OFFICE

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ELECTRODE

No Drawing.

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My invention relates to the manufacture and formation of electrodes and particularly for electrodes for use in the production of certain therapeutic rays.

5 The object of my invention is to provide a cheap, simple and efficient electrode which will be a prolific producer of ultra-violet rays, infra-red rays and the luminous rays of the solar spectrum which can be used generally by reason of its low cost in the treatment of individuals otherwise precluded from such treatments by reason of the expense incurred.

10 A further object of my invention is to provide electrodes which may be formed of metals in a transition stage and combined with carbides for producing the rays above enumerated.

15 About 1804 Bunsen discovered that he could connect two pieces of gas carbon to the terminals of a powerful battery and produce a brilliant light. Later the carbon or coke was made into the form of sticks by powdering it, mixing the powder with a binder (such as molasses, etc.) pressing it into form by hydraulic presses and sintering the mass to get rid of water and cause the particles to adhere closely together, and thus form a reasonably strong stick. Some years later it was discovered that by mixing certain metals with the carbon a much greater ultra-violet emission could be produced. It was also learned that the carbon electrodes could be cored with several metals, such as tungsten so that emission of ultra-violet rays would be greatly enhanced. While tungsten was the metal usually employed in the core of the electrodes, the cost of tungsten was so great that this was a very expensive feature and, in addition to the cost, tungsten gives off an acrid dark gas when burning so that this was an additional objection to this particular kind of electrode. Later, other metals and their salts were used such, for instance, as copper, uranium, fluorine, etc., which gave more or

less satisfaction, but copper consumes too rapidly and globules of the melted metal fall off from the sticks while the same are burning. The uranium used in the electrodes was quite satisfactory and produced rays which were rich in ultra-violet but the cost of uranium being about one dollar per gramme or more than one thousand dollars per kilogram made its use prohibitive.

20 In the production of the several metals, such as uranium, tungsten, vanadium, molybdenum, yttrium, titanium, thorium, tantalum and zirconium, there is a transition stage wherein the ores have been changed to ferro-alloys. This material is quite cheap and to my knowledge has never been utilized for the purpose contemplated by my invention. It has been found by experiment that when the straight ferro-alloys are made into electrodes and electric current passed into the same, that when the electrodes are brought into contact to be separated to thus produce an arc, the metals, upon first contact, will weld together and thus make it impossible or very difficult to separate them for producing the required arc. This is particularly true of ferro-uranium which is the preferable metal employed in carrying out my invention, although any of the other alloys enumerated are prolific producers of ultra-violet, infra-red, as well as the luminous rays of the solar spectrum. Closely following the preferred ferro-uranium is ferro-tungsten. In the use of the ferro-alloys, in the form of metallic electrodes, there is another difficulty in that while the same will readily arc when employing direct current, it has been found by experiment that very little can be accomplished with them on alternating current within a range of 110 to 500 volts. These experiments have developed the fact that for use with direct current a better production of the various wave lengths is obtained by employing one electrode of any of the aforementioned ferro-alloys or various combina-

tions of the above ferro-alloys and the other electrode composed of carbides of any of or all of the above-mentioned ferro-alloys. It has been found particularly true of ferro-uranium and ferro-uranium carbide. However, it has been found that on employing alternating current the above combination is not entirely satisfactory. In order to produce the best results, therefore, I have discovered that an admixture of free carbon should be used in both electrodes as the carbon ions serve to carry the current across the arcing space and thus permit a longer arc to be maintained. This combination, therefore, is the meat of this invention and my method of preparing these electrodes is as follows: Gas coke or carbon is first powdered to pass a fine screen of approximately a 200 mesh. Any one or more of the above-mentioned ferro-alloys is also powdered to pass a screen of approximately 200 mesh and the resulting carbon and ferro-alloy is mixed thoroughly together in various proportions and an organic binder composed of such materials as molasses, dextrin, grain flours, various gums, pitch, tar, etc., is then mixed with the resulting admixture which forms a rather stiff mass. This stiff mass is then formed into the shape of sticks by means of extrusion under great pressure and heat or by placing the mass into molds and forming them under extremely great pressure. After the electrodes have been thus formed they are placed in an oven and slowly heating thoroughly to dry the mass and remove all the volatile matter therefrom. The electrodes are then placed in a furnace having a very high temperature and in a more or less neutral atmosphere where they are sintered, thus converting the organic binders into carbon, while part of or all of the carbon in the mixture is converted into various carbides of the metals comprised in the ferro-alloys.

The electrodes thus produced will at once recommend themselves to all physicians and others employing ultra-violet, infra-red or the luminous rays of the spectrum for therapeutic purposes and can be used very efficiently in any apparatus employed for the above purpose and are particularly adapted for use in the form of apparatus invented and designed by my co-worker, William Cottrell, and described in an application for United Letters Patent, Serial No. 133,125, filed September 2, 1926, for Portable therapeutic device. The electrodes thus produced will be highly efficient in that they are slow burning and are rich in ultra-violet, infra-red and luminous rays of the spectrum and by reason of their low cost can be obtained for use on patients hitherto prohibited from treatment by reason of the expense entailed.

The spectrum obtained with one of the improved electrodes is substantially continuous in that it exhibits a great multitude of bright

lines in the ultra-violet region. This is caused by the fact that each of these metals, while having bright lines in the ultra-violet region, does not have them in the same identical space. Each line corresponds to a definite wave-length. Ordinary spectra, such as iron, have many wave lengths absent from the spectrum, but when a mixture of the above enumerated metals is used, the spectrum appears practically as one continuous bright band, very similar to the solar ultra-violet as well as visible spectrum. As the object is to produce a spectrum simulating sunlight, the improved electrodes fulfill this requirement. In the claims hereunto appended the term "spectra complementary of each other" is employed to point out that the bright lines of one spectrum fall into the dark spaces of another spectrum, thus bringing about the desired continuity of the spectra.

It is to be understood that by the term "ferro-alloy" in the hereto appended claims there are meant alloys of iron with metals having a high molecular weight, and, specifically, such metals as are contained in the fourth, fifth and sixth group of elements according to the periodic table of Mendelejeff and which metals are titanium, zirconium, thorium, vanadium, tantalum, molybdenum, tungsten, yttrium, and uranium.

It will be understood that while I have described uranium as the preferred ferro-metal, for use in my improved electrodes, I do not limit myself to this or any of the other metals above enumerated, nor do I limit myself to any exact formula for the production of the same, nor to the method described as the only means for producing my improved electrodes, but various combinations and uses will at once suggest themselves to persons engaged in applying therapeutic rays and to others skilled in the art, all of which objects and uses are included within the scope of this invention. I, therefore, reserve all such variations and modifications as may fall within the spirit and scope of the appended claims.

I claim:

1. An arc-lamp electrode capable of emitting a substantially continuous spectrum in the region of ultra-violet radiations which comprises carbon, iron carbide and at least two carbides of metals having complementary spectra rich in ultra-violet radiation.

2. An arc-lamp electrode capable of emitting a substantially continuous spectrum in the region of ultra-violet radiations which comprises carbon, iron carbide and at least two carbides of the metals of the group consisting of uranium, titanium, zirconium, thorium, vanadium, tantalum, molybdenum, tungsten and yttrium.

3. An arc-lamp electrode capable of emitting a substantially continuous spectrum in the region of ultra-violet radiations which comprises carbon, iron carbide and at least

two carbides of the metals of the group consisting of uranium, titanium, zirconium, thorium, vanadium, tantalum, molybdenum, tungsten and yttrium, said carbides existing
5 in the electrode uniformly and homogeneously dispersed therein.

4. An arc-lamp electrode comprising carbides of iron and of uranium.

In witness whereof, I have hereunto subscribed my name.
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JACQUES W. D. CHESNEY.

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