

I. LADOFF.
ELECTRICAL CONDUCTOR FOR LIGHTING PURPOSES.
APPLICATION FILED JUNE 18, 1904.

1,019,970.

Patented Mar. 12, 1912.



OXIDE OF TITANIUM AND METAL.

Witnesses
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Isador Ladoff Inventor
By his Attorney Walter S. Edwards.

UNITED STATES PATENT OFFICE.

ISADOR LADOFF, OF SCHENECTADY, NEW YORK, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF FIFTEEN ONE-HUNDREDTHS TO WALTER D. EDMONDS, OF BOONVILLE, NEW YORK, FIFTEEN ONE-HUNDREDTHS TO PHILIP C. PECK, OF NEW YORK, N. Y., AND SEVENTY ONE-HUNDREDTHS TO ANNA M. LADOFF, OF SCHENECTADY, NEW YORK.

ELECTRICAL CONDUCTOR FOR LIGHTING PURPOSES.

1,019,970.

Specification of Letters Patent.

Patented Mar. 12, 1912.

Original application filed December 2, 1903, Serial No. 183,528. Divided and this application filed June 18, 1904. Serial No. 213,065.

To all whom it may concern:

Be it known that I, ISADOR LADOFF, a citizen of the United States, residing in Schenectady, county of Schenectady, and State of New York, have invented certain new and useful Improvements in Electrical Conductors for Lighting Purposes, of which the following is a specification.

My invention relates to the constitution of that part or parts of an electrical conductor which are adapted to produce illumination when the current is turned on, as for instance the pencils of the arc light.

The accompanying drawing illustrates an elevation of a pencil embodying my invention as hereinafter described.

My researches have demonstrated that the metal titanium possesses properties which when that metal, or its oxid chemically combined with carbon, is introduced into the composition of the pencil of the arc light, results in a notable increase of candle power from its luminous arc as compared with that derived from other substances under similar conditions, and also results in increasing the life of the pencil when the current is turned on. Moreover the character of the resulting light is such as to avoid the disproportion of the red or other color lines objectionable in carbon pencils, and to approach more closely than has heretofore been accomplished the desired whiteness of sun light.

The titaniferous element may be incorporated into the pencil in many different ways, according to conditions presented by any particular case. For instance I have produced pencils embodying my invention for use in the arc light by constructing them out of an alloy of titanium and some other metal also giving a luminous arc and possessing greater conductivity as for instance iron, the alloy being treated and shaped as described in my original application for Letters Patent of the United States for my present invention filed December 2nd 1903, Serial Number 183,528, of which my present application is a division.

My now described invention relates to the incorporation of the titaniferous element into the pencil in the form of the oxid of

titanium instead of the elemental form of that metal. My pencils thus containing oxid of titanium may be constructed in any convenient manner. I have for instance produced them as follows: I first pulverized the oxid of titanium, rutile, (TiO_2) and I mix with the resulting powder pulverized metallic oxid as for instance preferably magnetite. To this mixture I added a sufficient quantity of any available binding material, as for instance water, glycerin, tar, linseed-oil or the like to impart to the powder adhesion and plasticity, such as to enable the material to be pressed or squirted into the desired form in molds under hydraulic or other pressures, in the manner, for instance, in which carbon pencils are now produced for a similar purpose. The resulting pencils were allowed to dry in the open air under room temperature for several hours, it being important, as will be appreciated in this art, to avoid a too rapid drying, which tends to distort the shape of the pencils. After this preliminary air drying, the pencils were further dried in an oven at a temperature of about 200 degrees C. or thereabout for a period of about forty-eight hours. After this the pencils were packed carefully in carbon, and subjected for about two days and two nights to a temperature of from 1200 to 1500 degrees C., after which they were cleaned and thus finished ready for use, care being taken, it will be observed, to expose them as aforesaid to a sufficiently high temperature in the presence of carbon, (or carbon monoxid, hydrogen or any other reducing agent might have been employed) and for a sufficient time to insure substantially complete reduction of the iron oxid added to the rutile as aforesaid so as to incorporate into and within the body of the pencil the metallic element of such iron oxid in its essentially metallic or elemental state. It follows that in all cases my pencils comprise a metal having conductivity adequate for the purposes of the arc light which said metal is homogeneously distributed throughout the body of the pencil in combination with the titaniferous element likewise homogeneously distributed, and that in these of my pencils

in which the titaniferous element exists as an oxid of titanium as aforesaid its said metal associate having the higher conductivity acts as a support or binder for said
5 oxid whereby the latter is, as it were suspended, and thus maintained in requisite form and protected as against breakage. The said mixture being thus, as it were, conglomerated. My said pencils are therefore,
10 in all cases properly characterized as being essentially metallic pencils, as distinguished from carbon pencils for instance, or from pencils consisting of compositions of other ingredients including metallic ingredients
15 such as oxids which are supported or rendered adequately conductive, or both, by separately constructed and applied metal devices such for instance as wires, tubes or cylinders, etc., or by merely external metallic coatings otherwise produced as by de-
20 oxidation of the surface of the pencil, my understanding being that the word "metallic" is answered by a substance containing or having the characteristics of a metal, and when I thus designate my pencils as being essentially metallic I thereby mean to use the word metallic in its proper sense, as signifying not a substance having some of the characteristics of a metal, but metal
30 itself.

It will be observed that the titaniferous element in my pencils exists in all cases in substantial proportions, say not less in any case than three per centum of the mass and
35 that when so existing it dominates the more conductive metal element with which it is as aforesaid associated, and controls the behavior of the latter in the pencil so that the iron for instance, which, as well known, is
40 unavailable by itself alone for such pencils, owing to sparking when the current is turned on and the inadequacy and unsatisfactory character of the resulting light, fails to
45 evince any of these prohibiting characteristics even though it should constitute as high as eighty per cent. of the mass of my pencils—on the contrary the aforesaid advantages characteristic of my pencils are nevertheless maintained, the spectrum character-
50 istic of titanium predominating. Moreover the presence of iron adds much to the steadiness of the arc, the conversion into metal of the iron oxid from the mixture containing it and oxid of titanium resulting in the forma-
55 tion of a very intimate connection between the iron and titanium oxid which gives to the electrode a remarkable homogeneity, besides which this metal thus intimately connected with the oxid renders the electrode
60 a good conductor of heat and electricity at ordinary temperatures.

That my said pencils are properly designated as essentially metallic pencils even when comprising the titaniferous element as
65 aforesaid also follows from the fact that

their arc normally moves from the negative to the positive electrode, the reverse being, as is understood, the case with pencils non-metallic as for instance carbon pencils or carbon pencils to which other ingredients, 70 as for instance metallic salts, have been added. I am not aware that metallic pencils have hitherto been constructed capable of being manufactured and used on an industrial scale. This difference in the direction 75 of the arc characteristic of my said essentially metallic pencils is of great importance and advantage. It results in the elimination in my positive electrode of the so called "crater" formed, during the passage of the 80 current, in the carbon electrode and in which crater the heat and light of the highest intensity are concentrated. On the contrary the most intense heat and light are located at the upper surface of my negative electrode, 85 and also the greatest dissemination of light is from the arc itself which is a luminous flaming arc, whereby as will be appreciated by those skilled in the art is secured a great increase not only of light efficiency but also 90 of light distribution.

Among the other advantages secured by reason of the essentially metallic character of my pencils may be mentioned the resulting considerably lower amperage required for their 95 operation as compared with carbon or other non-metallic electrodes and the increased durability, resistance to the influence of the elements and elegance of appearance due to the metal character of my pencils must also 100 not be overlooked. Another notable feature of my said pencils consists in their availability for use in combination with a positive electrode composed of another metal as for instance copper, that is to say in an arc 105 light apparatus one of my said pencils the metallic constituent of which is a ferric material, by which I mean elemental iron in any of its forms, may be used as a negative electrode in coaction with a copper positive electrode for instance and with about 110 the same beneficial results as though one of my said pencils was used for the positive and another of my said pencils for the negative electrode, the consequent economy of which 115 will be apparent, the copper electrode remaining substantially unconsumed.

As to the percentage of titaniferous element in my pencil, this may be widely varied without destroying the aforesaid 120 characteristic advantages attributable thereto. I have, in my application of my invention, found that when this element is introduced into the pencil in the form of rutile, anywhere from 15% to 90% of the latter 125 gives excellent results, the arc spectrum of my pencils showing a predominance of the lines due to both titanium and iron in electrodes in which the latter metal is associated with the titanium oxid as aforesaid. 130

What I claim as new and desire to secure by Letters Patent is the following, viz:—

1. A homogeneous electrode for arc lighting consisting of titanium oxid intimately mixed and conglomerated with a metal having greater conductivity than said oxid.
2. A homogeneous electrode for arc lighting consisting of titanium oxid intimately mixed and conglomerated with iron.
3. An arc light pencil comprising titanium oxid intimately mixed and conglomerated with a metal having greater conductivity than said oxid, substantially as and for the purposes described.
4. An arc light pencil comprising titanium oxid intimately mixed and conglomerated with iron, substantially as and for the purposes described.
5. An arc light electrode essentially metallic in composition, containing metallic iron and a titanium compound.
6. An arc light electrode essentially metallic in composition, and containing a titanium compound.
7. An essentially metallic arc light electrode comprising ferric and titanic materials.
8. An arc light electrode essentially metallic in composition, containing titanium oxid.
9. An arc light electrode conducting at ordinary temperatures and consisting principally of elemental iron mixed with at least 20 per cent. of titanium oxid.
10. An arc light electrode essentially metallic in composition and conducting at ordinary temperatures containing not less than 20 per cent. of titanium oxid.
11. An essentially metallic arc light electrode composed principally of elemental iron and oxid of titanium.
12. An arc light electrode composed principally of a mixture of titanium oxid with

some comparatively good conducting metal which in consuming gives a luminous or flaming arc.

13. An arc light electrode composed principally of titanium oxid, and containing also mixed with said oxid a metal in smaller proportion than said oxid.

14. An arc light electrode composed principally of titanium oxid and containing also mixed with said oxid, iron in smaller proportion than said oxid.

15. An arc light electrode composed principally of titanium oxid and containing also ferric material mixed with said oxid in smaller proportion than said oxid.

16. An essentially metallic arc light electrode conducting at ordinary temperatures containing at least 20 per cent. of titanium oxid, and, mixed with said oxid, iron in its elemental form.

17. An essentially metallic arc light electrode yielding an arc in whose spectrum titanium and iron lines predominate.

18. An essentially metallic arc light electrode conducting at ordinary temperatures, containing titanium oxid.

19. An arc light electrode essentially metallic in composition, containing titanium oxid.

20. An arc light electrode having as its principal constituents, elemental iron, and titanium chemically combined with oxygen.

21. An arc light electrode composed principally of a mixture of titanium oxid with metal in its elemental form.

22. An arc light electrode composed largely of metal in its elemental form conglomerated with a titanium compound.

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Witnesses:

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