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M. VON PIRANI.

METHOD OF PRODUCING HOMOGENEOUS BODIES FROM TANTALUM OR OTHER HIGHLY REFRACTORY METALS.

APPLICATION FILED MAR. 18, 1907.

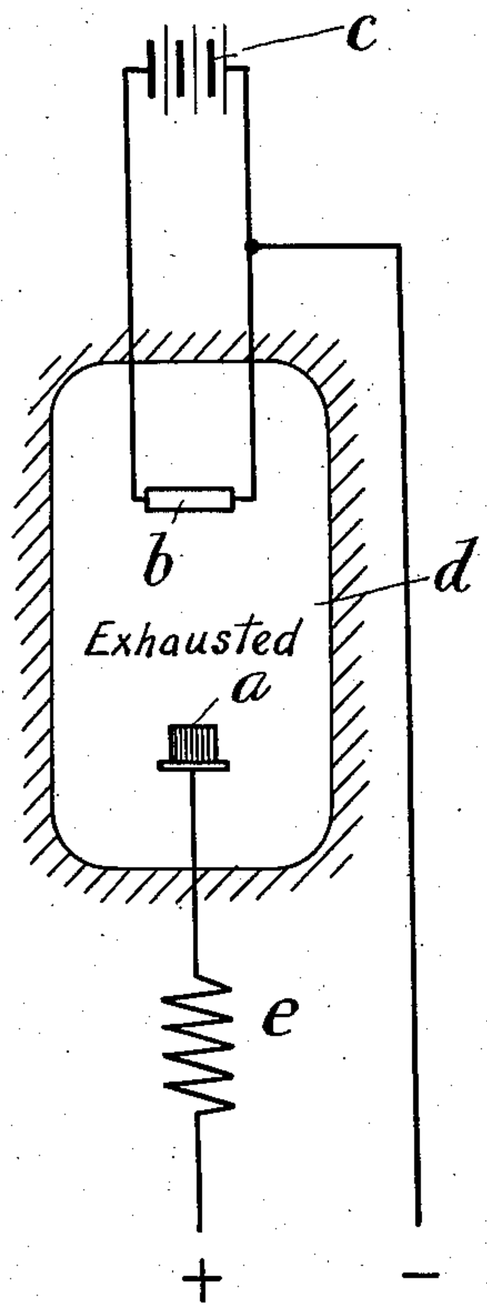
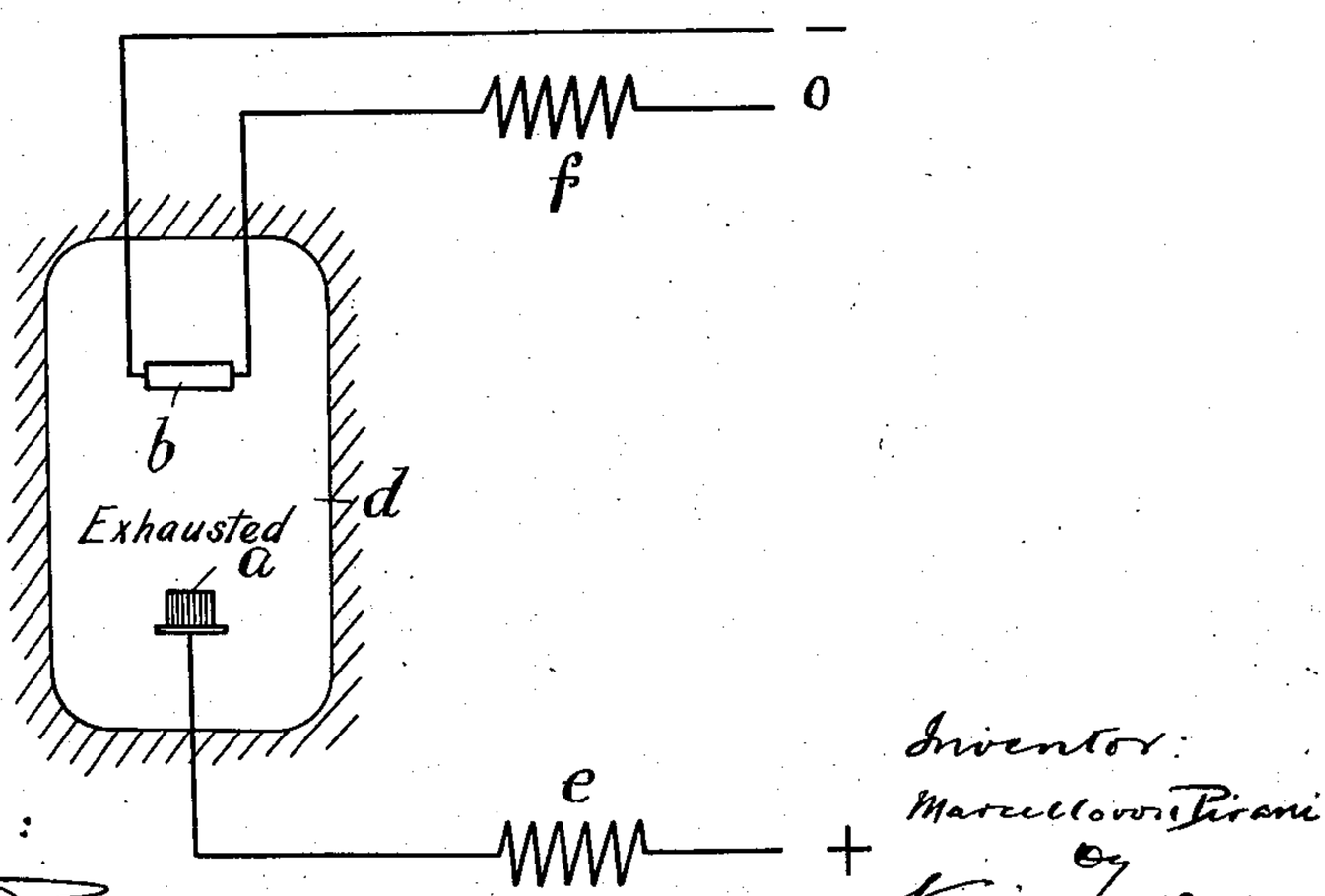


Fig. 1.

Fig. 2.



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UNITED STATES PATENT OFFICE.

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METHOD OF PRODUCING HOMOGENEOUS BODIES FROM TANTALUM OR OTHER HIGHLY-REFRACTORY METALS.

No. 873,958. Specification of Letters Patent. Patented Dec. 17, 1907.

Application filed March 18, 1907. Serial No. 362,821.

To all whom it may concern:

Be it known that I, MARCELLO VON PIRANI, a subject of the King of Italy, and resident of Wilmersdorf, near Berlin, Germany, have invented a certain new and useful Improvement in a Method of Producing Homogeneous Bodies from Tantalum or other Highly-Refractory Metals, of which the following is a specification.

The present invention relates to a method of producing homogeneous bodies from tantalum or other highly refractory metals.

Exceedingly coherent bodies are first made from the metallic powder by compression conglobation or concretion, said bodies then serving as positive electrodes in the combustion furnace; a metallic oxid which emits ions when heated is arranged in the furnace in connection with the cathode, for the purpose of facilitating the passage of the current between the electrodes even with a very high vacuum.

The production of homogeneous bodies from tantalum or other highly refractory metals has hitherto been effected by exceedingly solid bodies being made by compression or concretion from the metallic powder which was employed as the starting material. These bodies were heated to their melting point in an indifferent atmosphere between two electrodes by the electric current. The melting operation necessitated a relatively small expenditure of energy when the body which was to be melted was itself employed as a positive electrode in the formation of the arc formed by the current. With a very high vacuum, however, the arc passes with difficulty between the electrodes.

In accordance with the present invention a long and powerful arc can be formed in a very high vacuum. The advantage is simultaneously obtained that the electrodes do not require to be brought into contact one with another for the purpose of forming the arc. On the contrary the current passes of its own accord to the electrodes. This result is obtained by the residue of gas which remains in the vacuum furnace being ionized. The ionization is effected by a metallic oxid being placed in the furnace and heated. The oxid is preferably connected with the cathode, and the heating is most simply effected by means of a wire of platinum, tantalum, or the like which is embedded in the oxid and which is caused to glow by the passage of an electric current through the same. Barium oxid is particularly suitable for the ionization; further, strontium oxid, calcium oxid, or magnesium oxid, or other oxids may also be employed.

In order that the invention may be more clearly understood, reference is made to the accompanying drawing in which apparatus suitable for carrying the method into effect is shown by way of example diagrammatically in Figures 1 and 2.

Similar letters of reference refer to similar parts in both views.

In the figures, *a* indicates the body which is to be melted.

b represents the oxid and *d* the evacuated vessel or furnace in which the melting is to be effected. The oxid is heated by a wire which is connected to a source of current *c* and which is embedded in the oxid. The same wire may be simultaneously connected to the cathode of the source of current which is employed for melting the body *a* and which is used for forming the arc, whereas the body *a* which is to be melted is joined to the anode of the latter source of current. As soon as the oxid is sufficiently heated, which is the case at about red heat when employing barium oxid, the arc passes spontaneously between *a* and *b*. Even with a considerable distance between the anode and cathode, very considerable currents can be sent through the ionized vacuum chamber. For example, with an interval between the electrodes of several centimeters and at the tension of about 100 volts, an arc of 50 amperes and more may be produced by means of which the body *a* is easily melted.

The current may be regulated in a twofold manner; namely, on the one hand by regulating the temperature of the oxid, and on the other hand by regulating the strength of the current by means of a variable rheostat *e* in the main circuit.

An arrangement is represented in Fig. 2 in which a three wire system is employed. The current regulator *e* is located in the positive outer conductor which leads to the body *a* which is to be melted. The heating resistance in the oxid *b* is situated between the neutral conductor and the negative outer

conductor, and in the neutral conductor is also a variable resistance *f* which is used for regulating the temperature of the oxid. The current passes between the two outer conductors through the ionized vacuum. Even if continuous current is preferably employed in executing the method in accordance with the present invention, it is also possible to employ alternating current whereby similar effects are obtainable.

What I claim as my invention and desire to secure by Letters Patent is:

1. The method of producing homogeneous bodies from tantalum and other highly refractory metals which consists in creating a substantial vacuum, ionizing the residue of gas therein and subjecting the metal to the influence of an electric arc therein.

2. The method of producing homogeneous bodies from tantalum and other highly refractory metals, which consists in creating a substantial vacuum, ionizing the residue of gas therein, and forming therein an electric arc from the metal.

3. The method of producing homogeneous bodies from tantalum and other highly refractory metals, which consists in creating a substantial vacuum, ionizing the residue of gas therein, connecting the metal with the anode of an electric arc circuit therein and passing an electric current through said circuit.

4. The method of producing homogeneous bodies from tantalum and other highly refractory metals, which consists in creating a substantial vacuum, heating a metallic oxid therein and thereby ionizing the residue of gas therein, and subjecting the metal to the influence of an electric arc therein.

5. The method of producing homogeneous bodies from tantalum and other highly refractory metals, which consists in creating a substantial vacuum, heating a metallic oxid therein and thereby ionizing the residue of gas therein, and forming therein an electric arc from the metal.

6. The herein described process of producing homogeneous bodies from tantalum and other highly refractory metals, which consists in creating a substantial vacuum, heating a metallic oxid therein, and thereby ionizing the residue of gas therein, connecting the metal with the anode of an electric arc circuit and passing an electric current through said circuit.

7. The method of producing homogeneous bodies from tantalum and other highly refractory metals which consists in creating a substantial vacuum, electrically heating a metallic oxid therein and thereby ionizing the residue of gas therein, and subjecting the metal to the influence of an electric arc therein.

8. The method of producing homogeneous bodies from tantalum and other highly refractory metals which consists in creating a substantial vacuum, electrically heating a metallic oxid therein and thereby ionizing the residue of gas therein, and forming therein an electric arc from the metal.

9. The method of producing homogeneous bodies from tantalum and other highly refactory metals which consists in creating a substantial vacuum, electrically heating a metallic oxid therein, and thereby ionizing the residue of gas therein, connecting the metal with the anode of an electric arc circuit in said vacuum and passing an electric current through said circuit.

10. The method of producing homogeneous bodies from tantalum and other highly refractory metals which consists in creating a substantial vacuum, passing an electric current through a conductor embedded in a metallic oxid therein, and thereby ionizing the residue of gas therein, and subjecting the metal to the influence of an electric arc therein.

11. The method of producing homogeneous bodies from tantalum and other highly refractory metals which consists in creating a substantial vacuum, passing an electric current through a conductor embedded in a metallic oxid therein, and thereby ionizing the residue of gas therein, and forming therein an electric arc from the metal.

12. The method of producing homogeneous bodies from tantalum and other highly refractory metals, which consists in creating a substantial vacuum, passing an electric current through a conductor embedded in a metallic oxid therein, and thereby ionizing the residue of gas therein, connecting the metal with the anode of an electric arc circuit therein, and passing an electric current through said electric arc circuit.

13. The method of producing homogeneous bodies from tantalum and other highly refractory metals which consists in creating a substantial vacuum, connecting a metallic oxid therein with the cathode of an electric arc circuit therein, passing an electric current through a conductor embedded in the said metallic oxid, and thereby ionizing the residue of gas in said substantial vacuum, connecting the metal with the anode of said electric arc circuit and passing an electric current through said electric arc circuit.

In testimony whereof I have signed my name to this specification in the presence of the two subscribing witnesses.

MARCELLO VON PIRANI.

Witnesses:
HENRY HASPER,
WOLDEMAR HAUPT.