

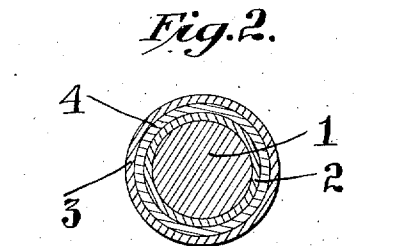
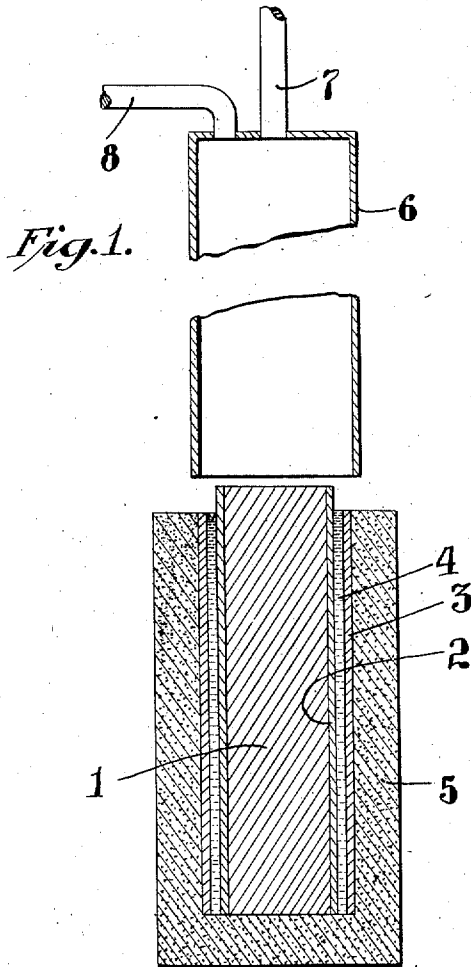
B. E. ELDRED.

COMPOUND METAL BODY AND PROCESS OF MAKING THE SAME.

APPLICATION FILED JAN. 7, 1908. RENEWED MAY 9, 1912.

1,043,578.

Patented Nov. 5, 1912.



Attest:
Frank E. Raffman

by

Inventor:
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UNITED STATES PATENT OFFICE.

BYRON E. ELDRÉD, OF BRONXVILLE, NEW YORK, ASSIGNOR TO THE COMMERCIAL-RESEARCH COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

COMPOUND METAL BODY AND PROCESS OF MAKING THE SAME.

1,043,578.

Specification of Letters Patent.

Patented Nov. 5, 1912.

Application filed January 7, 1908, Serial No. 409,618. Renewed May 9, 1912. Serial No. 696,277.

To all whom it may concern:

Be it known that I, BYRON E. ELDRÉD, a citizen of the United States, residing at Bronxville, in the county of Westchester and State of New York, have invented a certain new and useful Compound Metal Body and Process of Making the Same; and I do hereby declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to articles of iron or steel or the like weld-united to metals of extremely high melting point, such as platinum, iridium, etc., and in the process of producing the same.

Notwithstanding its high cost, platinum is extensively used for many purposes to which it is especially fitted by reason of its extremely high melting point, its substantial freedom from attack by acids, alkalis, oxygen, and many other chemical substances, its rate of expansion or contraction with changes of temperature, its electrical conductivity, its power of collecting and parting with a surface layer of oxygen, hydrogen, and other gases and vapors, its catalytic power, its color and surface appearance, and other well-known qualities. Its well-known softness, ductility, weakness under tensile and other stresses, and inability to take a temper militate against or prevent its use for many purposes, however; and while for most purposes for which it is used or desired to be used, only a surface of platinum is required, provided that surface can be attached permanently to a base of another metal, still it has not been practicable heretofore to produce an inseparable union between platinum and iron, steel or like metals in objects of material size; for which reason it has been common to use platinum in the form of wire, thin sheets, etc., notwithstanding the high cost of the metal, when a relatively infinitesimal non-porous coating of platinum inseparably united to a base of a stronger metal would do as well. Such stronger metal however must be a high-melting one since the low melting metals cannot safely be heated or be handled at any high temperature in contact with platinum.

In the patent to J. F. Monnot, No. 853,716 dated May 14, 1907, a method of inseparably

uniting iron, steel, and the like to copper, silver and other metals is set forth, consisting essentially, in contacting an iron or steel body, to be coated, with supermolten coating metal, that is, molten metal at a temperature much above the melting point of such metal, and then permitting the molten coating metal to solidify on the surface so contacted; and copper-coated iron or steel produced according to such process is now available. Molten copper and like metals at the very high supermolten temperature will produce a "wetting contact" with clean iron or steel surfaces and after cooling to solidification, the copper is found to be attached to the iron or steel by a union which is, or is equivalent to, a true weld union, the bodies of the two metals being joined at all points between abutting surfaces in a true metallic union. According to my invention, I bring close together a body of platinum or the like of suitable size and shape, and a body of iron, steel or the like of suitable size and shape and provided with an inseparably-united coating of this type, such coating being of copper, silver, gold, etc., and provide in the space between such platinum surface and such surface of copper, silver, etc., a molten body of such a high melting metal as gold, copper or silver, which is capable of uniting readily, while in the molten state, with both the platinum and the coating metal.

In the accompanying drawings I illustrate the process as applied to the production of platinum-coated rods. Obviously the process is not limited to the production of objects of any particular character or shape.

In said drawings: Figure 1 shows a central vertical section of apparatus adapted for carrying out the invention with a billet and tube to be united in place therein; Fig. 2 shows a transverse section of the completed billet, the relative thicknesses of the coating layers being shown exaggerated for clarity of illustration.

In the drawings, 1 designates a rod or billet of steel, iron, nickel-steel or the like, having a permanently-united or welded coating of a metal such as copper or silver. 2, 3 designates a tube of platinum within which the said billet 1 is placed, and 4 designates an intermediate body of molten metal, such as gold or copper, capable of uniting

inseparably both to the platinum 3 and to the coating 2.

5 5 designates a containing mold.

6 designates a bell jar adapted to receive the billet and provided with porter bar 7 by which the billet may be lowered into the mold and with means, such as a pipe 8 for supplying to the billet a neutral indifferent non-oxidizing atmosphere such as producer

10 gas.

In carrying out my invention the tube 3 is placed within the mold 5, both said tube and mold being preferably highly heated, and a suitable quantity of molten gold or other suitable metal, for example, silver or copper, is poured therein. A ferrous metal billet 1, to which a welded-on coating 2 of copper or like metal has previously been applied by any suitable method, for example that of the said Monnot Patent No. 853,716, is then placed within the mold; this billet preferably having already been heated. For convenience in handling the billet and avoiding oxidation of its surface, the heating is conducted under conditions precluding oxidation, and the billet is transferred to the mold 5 by means of the bell jar chamber 6 filled with producer gas and is lowered directly from said bell jar chamber into the mold. As the billet or core descends the molten metal used as a linking means, ascends in the space between the core and the tube. This having been done after solidification of the linking metal, the completed billet is removed from the mold and worked in any suitable manner to reduce it to the final form desired.

In working down, as for instance in forming the fine wires used for leading-in wires of incandescent lamps, the joined metals, being united by a weld union, coextend together throughout. And there having been wetting contacts between the metals of the joined layers in producing the weld-unions at the line of joinder, no spaces, spots or lines of non-union or non-contact exist to produce linear flaws or seams in the coextended article or the ultimate wire. In a leading-in wire, if such a flaw or seam exists or if there be not absolute metallic union between the joined metals, an avenue will inevitably open for the penetration of air or gases into the incandescent lamp. In reducing the joined metals, the coating layer or layers being basally held against lateral yielding by the weld union to the steel while compressed between the steel and the working tool, assume a hardened texture throughout which is much like the surface texture of hard-drawn wire and are hardened, compacted and planished.

While in the drawings the particular platinum article to be united to the core of lower melting point is shown as being a tube fitting closely to the sides of the mold, the

molten metal being within its interior, it is obvious that the particular shape shown is not material to the invention; but the shape shown is suitable for the production of an ingot from which platinum coated wire and the like may be drawn. It is obvious that by employing proper molds, and proper forms of platinum objects to be treated, ingots, slabs, or blanks of non-platinum metals coated with platinum or like metals on the outside or inside, or both or all sides, may be produced. Likewise, the same method may be employed in making objects coated with iridium or other metal of extremely high melting point.

Platinum-coated iron wire, produced by drawing down a platinum-iron billet produced as above described, is particularly suited for use as leading-in wire for incandescent electric lamps and other exhausted glass articles and the like, iron, like platinum, having a rate of expansion and contraction approaching that of some types of glass and having a sufficiently high melting point to enable it to withstand the heat of molten glass. The use of iron leading-in wires has not been practicable, heretofore, because of the impossibility of producing a gas-tight joint between iron and glass; such difficulty not being experienced, however, in the case of platinum. So far as forming a joint between it and glass is concerned, the platinum-covered iron wire acts in the same manner as solid platinum. The platinum sheath acts as a sort of linking means, cohering to the glass on the one side and to the iron on the other with a permanent, gas-tight union in both cases. Iron wire coated with platinum as described is also suitable for use as resistance wire, the platinum covering preventing oxidation of the iron beneath, even when the latter is heated to a high temperature. For many purposes the platinum-covered iron has important advantages as compared with solid platinum, being much stronger and harder, and, in the case of steel-covered platinum the steel of which contains a proper proportion of carbon, being capable of being hardened and tempered the same as steel.

In leading-in wires, the ferrous metal used may advantageously be nickel steel. By varying the proportion of nickel in the steel, the coefficient of expansion of the steel may be varied within considerable limits so as to make the coefficient of expansion of the wire as a whole exactly or substantially equal to that of the particular glass in which the leading in wire is to be sealed.

For many purposes for which platinum is now used, it is desirable to have a certain amount of superficial porosity; as where its catalytic powers are to be utilized, such porosity increasing the total adsorbing surface, and in use for such purposes, it is fre-

quently found that its porosity increases. This porosity in case of platinum welded directly to steel, and with the article produced by using gold as a linking means and therefore having thin coatings possible in the present invention, might lead to avenues opening to the underlying steel, but with the intervening film of gold, welded to both metals, such avenues cannot open, gold not sharing this property of platinum in such gold-linked compound metal while it does share in its resistance to ordinary chemical attack. The superficial porosity of the platinum may be even purposely increased by suitable treatments where the compound metal is to be used for catalytic purposes, as in the oxidation of sulfur dioxide, in the manufacture of aldehydes, in self-lighting gas burners, etc. For such purposes, the compound metal after manufacture may be partially superficially corroded, it may be exposed to mixtures of reacting gases, or it may be wetted with a solution of a platinum salt and heated.

While copper may be used as the molten metal uniting the core with a platinum sleeve in lieu of gold, I do not claim this specifically herein, neither do I specifically claim herein metal articles of adjusted expansion, claims to this matter occurring in my copending application Serial No. 477,281, filed February 11, 1909.

I have described and claimed catalytic bodies of the character stated in another application, Serial No. 409,622, filed Jan. 7, 1908.

By the term "metal of extremely high melting point", used herein, I mean a metal the melting temperature of which is in excess of 2900° F. or in excess of the melting point of iron. By high melting metals, as used in the present case, I mean metals having a melting point which, like the melting point of copper, silver and gold, is high enough to allow the metal to be worked at steel working temperatures.

What I claim is:—

1. The process of producing compound metal bodies, comprising a metal of the platinum group and an unlike metal of lower melting point inseparably united, which consists in bringing into proximity a heated body of a platinum metal and a heated body of an unlike high-melting metal to be united thereto, and bringing into the space between them a molten body of high-melting metal capable of uniting with both such metals and permitting the molten metal to solidify.

2. The process of producing compound bodies of unlike metals comprising a metal of the platinum group and a ferrous metal inseparably united, which consists in bringing into proximity a body of such platinum group metal and a body of ferrous metal

having on its surface an inseparably united coating of a high-melting non-ferrous metal and bringing into the space between such platinum group metal and the said coating, a molten body of a high-melting metal capable of uniting to both.

3. The process of producing compound bodies of unlike metals comprising a platinum group metal and a ferrous metal inseparably united, which consists in inseparably uniting to a ferrous metal a coating of a high-melting non-ferrous metal, placing such object with the coating thereon in proximity to a body of platinum group metal and bringing into the space between them a molten body of a high-melting metal capable of uniting to both, and permitting it to solidify.

4. The process of producing compound bodies of unlike metals comprising a platinum group metal and a ferrous metal inseparably united, which consists in inseparably uniting to a ferrous metal a coating of a high-melting non-ferrous metal, placing such object with the coating thereon in proximity to a body of platinum group metal and bringing into the space between them a molten body of gold, and permitting it to solidify.

5. A compound metal object comprising a layer of platinum group metal inseparably united to a layer of ferrous metal by layers of non-ferrous metals having melting points lower than either the platinum group metal or the ferrous metal, such intermediate layers inseparably united to each other and one inseparably united to the ferrous metal and another to the platinum group metal.

6. A compound metal object comprising a layer of platinum inseparably united to a layer of ferrous metal by layers of non-ferrous metals having melting points lower than either the platinum or the ferrous metal, such intermediate layers inseparably united to each other and one inseparably united to the ferrous metal and another to the platinum.

7. A compound metal object comprising a layer of platinum group metal and a layer of ferrous metal inseparably united by intermediate layers of copper and gold, the copper inseparably united to the ferrous metal, the gold inseparably united to the platinum group metal and said copper and gold layers inseparably united to each other.

8. A compound metal object comprising a layer of platinum and a layer of ferrous metal inseparably united by intermediate layers of copper and gold, the copper inseparably united to the ferrous metal, the gold inseparably united to the platinum and said copper and gold layers inseparably united to each other.

9. A compound metal object comprising a layer of platinum inseparably united to a

layer of ferrous metal by intermediate layers of non-ferrous metals having melting points lower than either the platinum or the ferrous metal, such intermediate layers being inseparably united to each other and one being inseparably united to the ferrous metal and another to the platinum, said plurality of joined layers having been extended together.

10 10. A compound metal object comprising a layer of platinum inseparably united to a layer of ferrous metal by intermediate high-melting non-ferrous metal, such metal having a melting point below either the platinum or the ferrous metal, such intermediate metal being inseparably united to the ferrous metal and to the platinum, and the plurality of joined layers having been extended together.

20 11. A compound metal object comprising a layer of platinum inseparably united to a layer of ferrous metal by intermediate linking high-melting non-ferrous metal, such linking metal comprising a layer of copper and such intermediate metal being inseparably united to the nickel-steel and to the platinum.

30 12. A compound metal object comprising a layer of platinum inseparably united to a layer of ferrous metal by intermediate link-

ing high-melting non-ferrous metal, such linking metal comprising a layer of copper and such intermediate metal being inseparably united to the ferrous metal and to the platinum, and the plurality of joined layers of metal having been extended together.

13. A compound metal object comprising a layer of platinum inseparably united to a layer of nickel-steel by intermediate linking high-melting non-ferrous metal, such linking metal comprising a layer of copper and such intermediate metal being inseparably united to the nickel-steel and to the platinum.

14. A compound metal object comprising a layer of platinum inseparably united to a layer of nickel-steel by intermediate linking high-melting non-ferrous metal, such linking metal comprising a layer of copper and such intermediate metal being inseparably united to the ferrous metal and to the platinum, and the plurality of joined layers of metal having been extended together.

In testimony whereof I affix my signature, in the presence of two witnesses.

BYRON E. ELDRED.

Witnesses:

PHILLIPS BLAGDELL,
H. M. MARBLE.

Corrections in Letters Patent No. 1,043,578.

It is hereby certified that in Letters Patent No. 1,043,578, granted November 5, 1912, upon the application of Byron E. Eldred, of Bronxville, New York, for an improvement in "Compound Metal Bodies and Processes of Making the Same," errors appear in the printed specification requiring correction as follows: Page 4, line 26, for the compound word "nickel-steel" read *ferrous metal*, and same page, line 51, for the words "ferrous metal" read *nickel-steel*; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 28th day of January, A. D., 1913.

[SEAL.]

C. C. BILLINGS,
Acting Commissioner of Patents.

layer of ferrous metal by intermediate layers of non-ferrous metals having melting points lower than either the platinum or the ferrous metal, such intermediate layers being inseparably united to each other and one being inseparably united to the ferrous metal and another to the platinum, said plurality of joined layers having been extended together.

10 10. A compound metal object comprising a layer of platinum inseparably united to a layer of ferrous metal by intermediate high-melting non-ferrous metal, such metal having a melting point below either the platinum or the ferrous metal, such intermediate metal being inseparably united to the ferrous metal and to the platinum, and the plurality of joined layers having been extended together.

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