G. COOPER.

PROCESS FOR COATING A METALLIC BODY.

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1,121,169.

Patented Dec. 15, 1914.

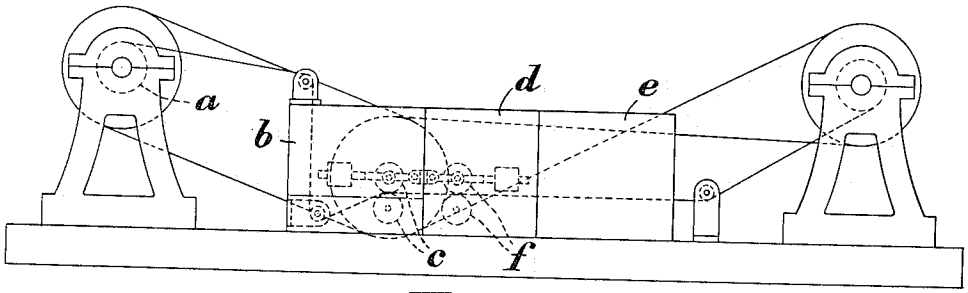


Fig. 1.

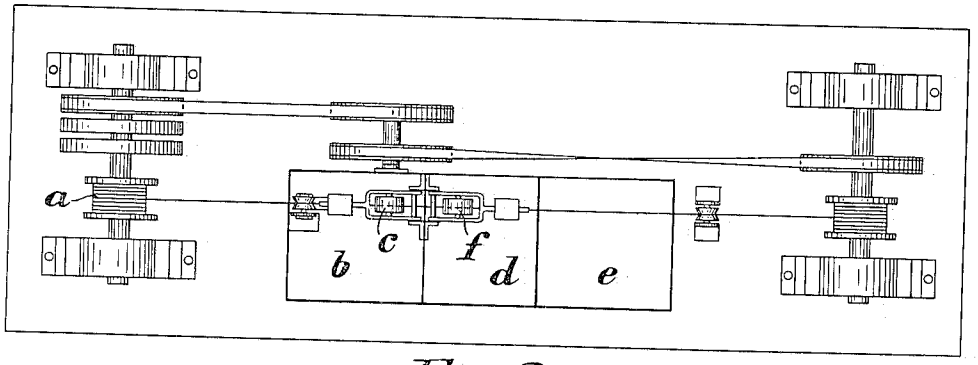


Fig. 2.

Fig. 3.

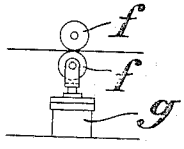
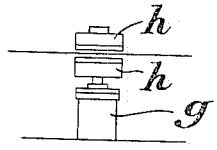


Fig. 4.



Witnesses

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UNITED STATES PATENT OFFICE.

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PROCESS FOR COATING A METALLIC BODY.

1,121,169. Specification of Letters Patent. Patented Dec. 15, 1914.

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To all whom it may concern:

Be it known that I, GEORGE COOPER, a subject of the King of Great Britain, residing at Birmingham, in the county of Warwick, in the Kingdom of England, have invented certain new and useful Processes for Coating Metallic Bodies, of which the following is a specification.

It has been proposed to coat metallic resistance bodies with a surface layer of one or more of the noble metals (such as gold and silver or platinum and other metals of the platinum group) with the object of protecting the bodies against oxidation, or against other destructive influences to which they are subjected in use, the protection being particularly necessary in the case of resistance bodies which have to be raised to a high temperature, such as 1000° centigrade, for heating by radiation. By the term noble metals I understand gold, silver, platinum, metals of the platinum group and also chromium, tungsten and other metals which exert a protective influence at high temperatures.

The present invention consists in an improved method of treatment by which the coating is rendered more complete and durable so as to form a permanent protection.

In accordance with this invention in applying the coating to the resistance body the outer portion of said body is impregnated with a colloidal solution of the noble metal or metals in such manner that there is actual engagement between the particles of the outer layer of the resistance body and the surface layer of noble metal applied thereto, the two layers penetrating one into the other. In other words, the resistance body after impregnation may be considered to possess a micro-porous outer layer, the interstices of which are filled up by the particles of the noble metal.

The coating of the resistance body in accordance with the method above set forth may be performed by slightly oxidizing the surface of the body and then passing the body through the coating solution so that the layer of oxid absorbs this solution and becomes impregnated therewith. The surface of the resistance body is preferably subjected to pressure while in the coating solution, or after it leaves the bath. In another form of the process the surface of the metal of the resistance body itself may be impregnated without a film of oxid being first produced. In this case impregnation is effected by heating the metal and the coating solution and subjecting the metal after it has been coated, to heavy pressure. Satisfactory results have been obtained when the metal and bath have been heated to between 175° F. and 200° F., and a pressure of 300 atmospheres has been used.

Arrangements for carrying out the process will be described by the aid of the accompanying drawings, in which:—

Figures 1 and 2 are an elevation and plan, respectively, of apparatus for carrying out one form of the process; and Figs. 3 and 4 show modified parts of the apparatus when used for carrying out the process in another form.

It will be understood that these illustrations are only of a diagrammatic nature. Suitable resistance bodies are composed of pure nickel or of a nickel-chromium alloy. As colloidal solutions of the noble metals I prefer to employ those in essential oils, which are prepared in known manner.

In the arrangement illustrated in Figs. 1 and 2 resistance material in the form of strip of which the surface has previously been oxidized is supplied from a drum *a* and passes down into a chamber *b* containing a bath of coating solution. The strip is guided below the surface of this solution and then passes between a pair of painting rollers *c*, the lower of which is mounted so as to be almost entirely covered by the solution. After passing through these rollers the strip will generally be carried through a drip chamber *d* and then to a drying chamber *e* in which the greater part of the solvent is driven off. After leaving the drying chamber the resistance body can be further treated with heat, for instance by passing a current through it, so as to raise it to a comparatively high temperature, but this final drying step is not necessary in all cases since when the resistance body is used for heat radiating purposes it will be raised to a sufficiently high temperature to complete the process.

Where the resistance body has been provided with a film of oxid before treatment with the solution, it will not be necessary to use very high pressure, but it is desirable to press the painting rollers *c* together, for instance, by weighting the upper roll, as indicated in Figs. 1 and 2, and it is also desirable to provide a pair of leveling rollers *f*

in the drip chamber, these rollers being also pressed together, for instance, by a weight, as indicated in the drawings. Where it is a case of impregnating metal without a film of oxid there must be provision for applying high pressure to the resistance body after it has passed through the solution. For this purpose the leveling rollers *f* may, as indicated in Fig. 3, form part of a press, one of them being held stationary and the other being carried by the ram of a hydraulic cylinder *g*. In place of leveling rollers for applying the high pressure, press plates *h* (Fig. 4), may be used. In this case, of course, the resistance body cannot be moved continuously past the press.

It has been found desirable in some cases to heat the pressure plates to a temperature of between 550° and 750° F. The rollers or the press plates are preferably formed so as to fit the shape of the cross section of the resistance body and they are preferably provided with a moist coating of the solution.

It is to be understood that the arrangement above described is only mentioned by way of example as being suitable for carrying out the process of impregnation.

Although oxid has been spoken of as the material of the absorbent layer in one of the forms of the process, it is to be understood that other compounds could take the place of oxids provided that they were such as to form an absorbent coating adhering firmly to the resistance body and capable of being impregnated with the coating solution. An oxid film appears however, to be the most suitable, since it can be produced on most metals used for resistance bodies by simply heating them to a red heat in the atmosphere.

I declare that what I claim is:—

1. The process for applying a surface layer of a noble metal to a metallic body which includes the step of impregnating an outer superficial layer on said body with a colloidal solution of the noble metal so that the particles of said noble metal interpenetrate the particles composing said superficial layer.

2. The process for coating a metallic body with a surface layer of a noble metal which comprises forming a thin film of an absorbent compound on the outer surface of said body and then applying a colloidal solution of a noble metal to said thin film.

3. The process for coating a metallic body with a surface layer of a noble metal which comprises impregnating the outer surface layer of said body with a colloidal solution of a noble metal by the combined action of heat and heavy pressure.

4. The process for coating a metallic body with a surface layer of a noble metal which comprises coating the surface of said body with a colloidal solution of a noble metal and subjecting said body when coated with said solution to the combined action of heat and heavy pressure.

5. The process for applying a surface layer of a noble metal to a metallic body which includes the step of impregnating an outer superficial layer on said body with a colloidal solution of a noble metal such as gold in an essential oil, so that the particles of said noble metal interpenetrate the particles composing said superficial layer.

In witness whereof, I have hereunto signed my name this 2nd day of May 1913, in the presence of two subscribing witnesses.

GEORGE COOPER.

Witnesses:
FRED CARTER,
PERCY WM. HAYWOOD.