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METHOD OF TREATING METAL ARTICLES

Filed July 13, 1923

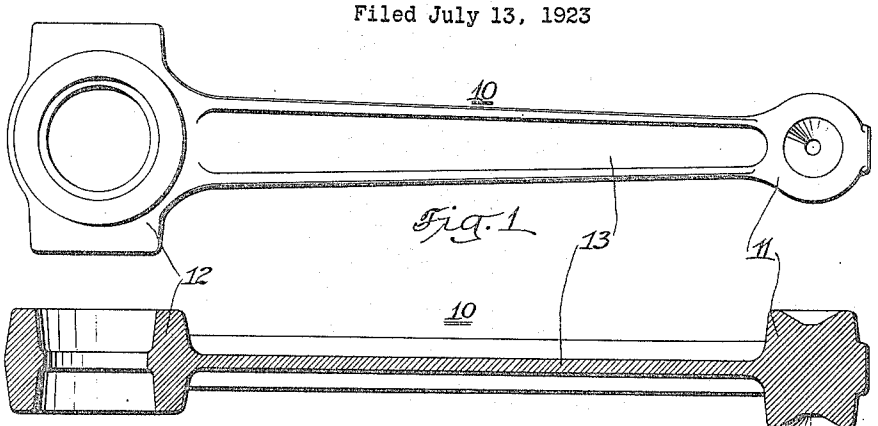


Fig. 1

Fig. 2

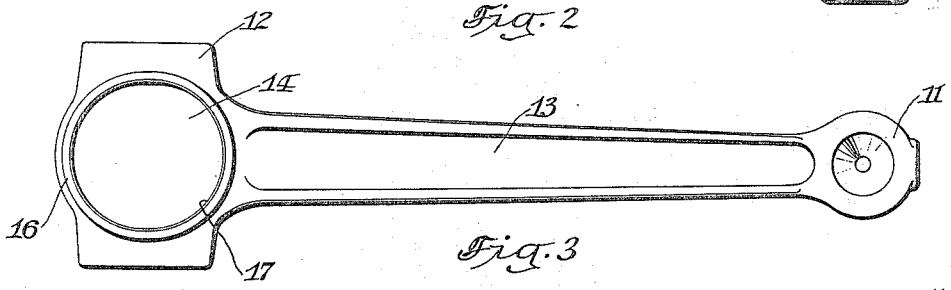


Fig. 3

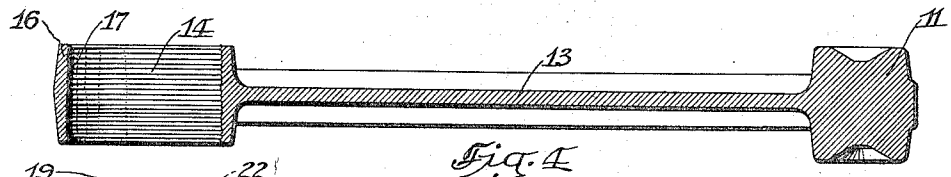


Fig. 4

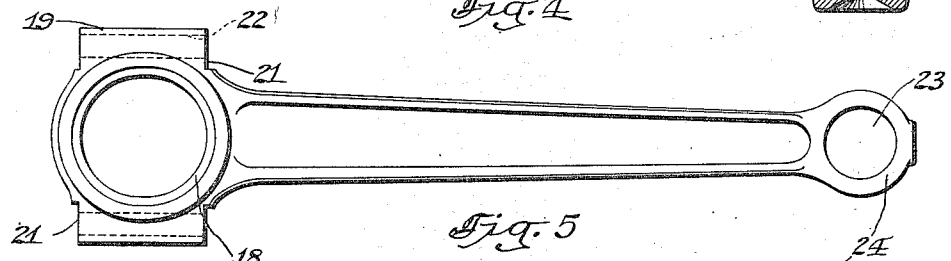


Fig. 5

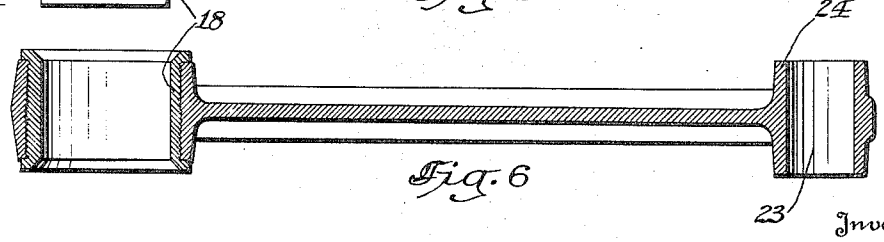


Fig. 6

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UNITED STATES PATENT OFFICE.

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METHOD OF TREATING METAL ARTICLES.

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The present invention relates to a method of securing an alloy or a metal to a portion only of the surface of a metal member, and the product of such method.

It has been proposed to treat metal members or articles to render them immune to the effect of certain elements, for example, it has been proposed to treat iron or steel articles to render them immune to atmospheric moisture, that is to say, to render them rustless.

According to the present invention, it has been discovered that certain alloys such as Babbitt metal, and certain metals such as tin, will not adhere to an iron or steel article so treated. The present invention aims to provide a process whereby such alloy or metal may be secured to the metal member or article.

For purposes of illustration, the invention will be described in connection with the manufacture of iron or steel connecting rods, although it is to be distinctly understood that the invention is not thus limited but includes the manufacture of other articles.

The objects and features of novelty of the invention will be apparent from the description taken in connection with the drawings, in which:

Fig. 1 is a side elevation of a connecting rod forging;

Fig. 2 is a longitudinal section through the connecting rod shown in Fig. 1, in a plane at right angles thereto;

Figs. 3 and 4 are views corresponding to Figs. 1 and 2 respectively, of a connecting rod after treatment and rough machining in preparation for the formation of the Babbitt metal bearing thereon, and

Figs. 5 and 6 are views corresponding to Figs. 3 and 4 respectively, illustrating further steps in the manufacture of a connecting rod.

In the manufacture of connecting rods for internal combustion engines, the rod forgings, after suitable heat treatment, and straightening, are rough machined, preparatory to babbitting the bearing at the large end thereof. These forgings are then usually treated with an acid flux and tinned, after which suitable mandrels are placed in the end of the rod and the annular space around the mandrels is filled with molten Babbitt metal, poured from a suitable ladle, to form the bearing surfaces required. The tin is applied to form a surface to which the Babbitt metal will readily adhere, and the best method of applying this coat of tin is to dip the connecting rod in an appropriate tinning bath.

This procedure has heretofore resulted in coating with tin, more of the rod surface than is to be babbitted, and subsequently, during the casting of the bearing, the Babbitt metal at the end of the pouring operation overflows onto the rod and adheres firmly thereto. This excess Babbitt metal must be removed from the rod before proceeding with the finishing machine operations thereon. In usual practice, the excess metal is removed by the use of revolving, power driven, wire brushes and in some cases by filling or scraping by hand with a hard instrument. Such methods require considerable time, and the brushes wear rapidly, so that this removal of excess metal becomes an expensive part of the process.

In the present invention, those parts of the connecting rod on which the Babbitt metal is not desired are given a coating of material to which neither the tin nor the Babbitt metal will stick. The invention also consists in the discovery that neither Babbitt metal nor tin will stick to a surface coated with basic phosphate of iron. More specifically therefore, the invention consists in forming on certain parts of the connecting rod a coating of basic phosphate of iron, and in then applying the tin and the Babbitt metal in the usual manner.

With reference to the drawing, at 10, Figs. 1 and 2, is shown a connecting rod forging which has received suitable heat treatment and has been straightened to correct any warping or twisting incurred during the cooling of the piece. The forging comprises a small or piston pin end 11, and a large or crank shaft end 12, connected by the usual shank portion 13. The forging 10 is first carefully washed, to remove therefrom grease, oil and other surface dirt, and then is treated to form thereon a protective coating, for example a coating of basic phosphate of iron.

The basic phosphate of iron is preferably formed on the forging 10 by immersing it in an aqueous bath of ferric acid phosphate, preferably containing from one-half to one

per cent of this salt, the bath being usually maintained at substantially a boiling temperature. The surfaces of the forging 10 become black as the basic phosphate of iron is formed, the reaction being accompanied by the escape of hydrogen gas.

After the formation of the protective coating is completed, the forging 10 is removed from the bath, and is machined to remove the coating from those portions to which the Babbitt metal is to be applied. As shown in Figs. 3 and 4, this machining consists in drilling the large end 12 of the forging 10 to form a hole 14 of appropriate size, the sides of the piece being also machined to form faces 16 adjacent the hole 14. The inner surface of the hole 14 is also preferably formed with a number of circumferential grooves 17, which assist in retaining the Babbitt metal. It will be evident that this machining operation removes the protective coating, that is, the basic iron phosphate, from those portions of the piece to which the Babbitt metal must adhere, exposing the bare metal, while the integrity of the coating over the remainder of the piece is undisturbed.

The piece is next treated with an acid flux and is then plunged into a suitable tinning bath in the ordinary manner. As previously stated, the tin will not adhere to the surface of iron phosphate, so that this operation results in a coating of tin over the exposed parts of the piece which have been machined, the remainder thereof being unaffected. The tin is applied to form a surface to which the Babbitt metal will more readily adhere.

After the tinning operation, a suitable mold is placed in position to cooperate with the large end of the rod, and the molten Babbitt metal is poured in the usual manner. Any of the Babbitt metal which overflows onto the rod will not, however, adhere thereto, because of the coating of basic iron phosphate. The pouring of the Babbitt metal, therefore, results in the formation of an annular bearing 18, which is strongly adherent to the tinned surfaces against which it is cast. The rod is then ready for the finishing operations, such as those by which the bolt lugs 19 are provided with faces 21 and bolt holes 22, and the small end of the rod is drilled as at 23, and faced as at 24, for the usual piston pin bushing.

It will be evident that this invention provides a simple, inexpensive and reliable process by which an alloy such as Babbitt metal may be secured to certain portions of metal articles, without necessitating the subsequent expensive cleaning of alloy from surfaces of the piece, where it is not desired. The invention also provides a convenient and inexpensive method by which a coating of tin may be applied to certain desired portions of iron and steel articles by the dipping or washing process, without covering the remainder of the article with this metal.

Although a specific method has been described, it is to be understood that the invention is not thus limited, but includes modifications and changes which come within the scope of the appended claims.

What is claimed is:

1. The method of securing an alloy to a portion only of the surface of a metal member to which the alloy normally adheres, consisting in treating the member to change the metal at and adjacent its external surface into a different chemical substance forming a coating to which the alloy will not adhere, operating on said portion of the surface of the member to remove said coating, and applying the alloy in molten form to said portion of the surface.

2. The method of attaching an alloy to a portion only of the surface of an iron or steel article to which the alloy normally adheres, consisting in treating the article to change the iron or steel at and adjacent its external surface into a different chemical substance forming a coating, to which the alloy will not adhere, operating on said portion of the surface of the article to remove said coating, and applying the alloy in molten form to said portion of the surface.

3. The method of attaching an alloy to a portion only of the surface of a metal member to which the alloy normally adheres, consisting in treating the member to change the metal at and adjacent its external surface into a different chemical substance forming a coating to which the alloy will not adhere, operating on said portion of the surface of the member to remove said coating, tinning said surface and applying the alloy in molten form to the tinned surface.

4. The process of applying Babbitt metal to portions of iron and steel articles which consists in first forming on the article a coating of basic iron phosphate, then in removing said coating from the portions to be babbitted, and thereafter casting Babbitt metal against said portions.

5. The process of applying Babbitt metal to portions of iron and steel articles which consists in first forming on the article a coating of basic iron phosphate, then in removing said coating from the portions to be babbitted, then coating said portions with tin, and thereafter casting Babbitt metal against said portions.

6. The process of applying Babbitt metal to portions of iron and steel articles which consists in first forming on the article a coating of basic iron phosphate, then in removing said coating from the portions to be babbitted, then fluxing and tinning said portions, and thereafter casting Babbitt metal against said portions.

7. The process of applying Babbitt metal to portions of iron and steel articles which consists in first immersing the articles in a solution of ferric acid phosphate to form a surface of basic phosphate of iron thereon, then removing the basic phosphate of iron from the said portions of the articles, then immersing the articles in a tinning bath to form a coating of tin on the said portions, and finally in pouring molten Babbitt metal against the said portions.

8. The process of tinning certain portions of iron and steel articles which consists in forming a surface coating of basic phosphate of iron on the entire article, removing said surface coating from the portions to be tinned, and then immersing the article in a tinning bath.

9. The process of tinning certain portions of iron and steel articles which consists in forming a surface coating of basic phosphate of iron on the other portions of the article, and then immersing said article in a tinning bath.

10. The process of tinning certain portions of metallic articles which consists in forming on the entire article a surface coating of a metallic salt to which tin will not stick, removing the surface coating from said certain portions of the article, and immersing the article in a tinning bath.

11. The process of tinning portions of iron and steel articles which consists in immersing the articles in a solution of ferric acid phosphate, then machining the portions to be tinned, and then immersing the articles in a tinning bath.

12. The process of tinning portions of iron and steel articles which consists in immersing the same in a boiling aqueous solution containing about one per cent of ferric acid phosphate, then machining the portions to be tinned, and then immersing the articles in a tinning bath.

13. The process of tinning portions of iron and steel articles which consists in immersing the same in a solution of ferric acid phosphate, then machining the portions to be tinned, then fluxing the articles in an acid bath, and finally immersing the articles in a tinning bath.

14. The process of applying Babbitt metal to certain portions of metallic articles which consists in forming on the entire surface of the article a coating of a metallic salt to which Babbitt metal will not adhere, then removing the coating from the said certain portions, then tinning said portions, and thereafter casting the Babbitt metal against said portions.

15. The process of applying Babbitt metal to certain portions of metallic articles which consists in forming on the entire surface of the article a coating of a metallic salt to which Babbitt metal will not adhere, removing the coating from the said certain portions, and thereafter casting the Babbitt metal against said portions.

16. The process of preparing a connecting rod forging for the reception of Babbitt metal bearings which consists in first washing the forging to remove dirt therefrom, then forming on the surface of the forging a coating of basic iron phosphate, then machining the babbitt receiving portions of the forging, then dipping the forging in a tinning bath, and finally casting the Babbitt metal in position on said forging.

In testimony whereof I affix my signature.

MARK BENTLEY.