Sept. 25, 1928. 1,685,657

W. R. WHITNEY

COMPOSITE METAL ARTICLE

Filed July 19, 1922

Fig. 1.

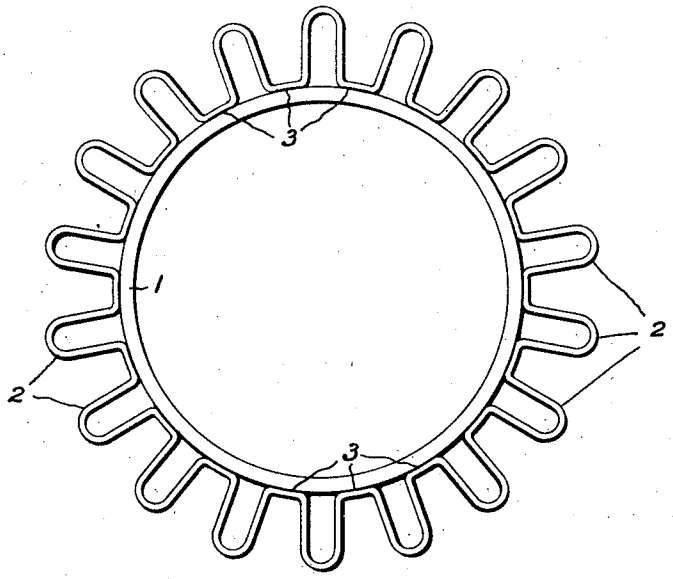


Fig. 2.

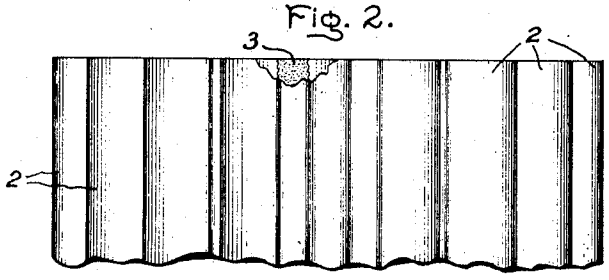
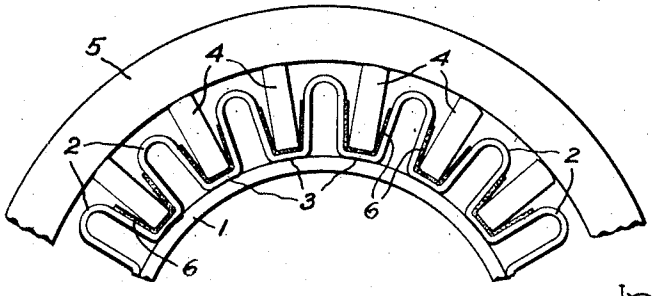


Fig. 3.



Inventor:
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UNITED STATES PATENT OFFICE.

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COMPOSITE METAL ARTICLE.

Application filed July 19, 1922. Serial No. 576,125.

The present invention has for its object the production of articles consisting of preformed objects of ferrous metal and of cupreous metal welded or joined to each other in such a manner as to constitute a unitary article.

Preformed articles of copper, for example, sheets of copper, heretofore have been joined to ferrous metal, such as steel or iron, by riveting, brazing, or soldering. As a result of my invention, I have provided a composite body consisting of iron and copper having better mechanical and thermal properties than the bodies produced by these prior methods.

In accordance with my present invention, I have produced a composite article comprising preformed parts of ferrous metal and copper united by a single operation, which constitutes a novel process. I have utilized for the production of the union a metal capable of readily alloying with and spreading as a thin film over the contacting surfaces of the metals to be united under conditions producing a sound, strong union.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claims; my invention itself, however, both as to its application and the method of carrying the same into effect will best be understood by reference to the following description taken in connection with the accompanying drawing.

The drawing illustrates one embodiment of my invention; Fig. 1 is an end view of a composite metal body; Fig. 2 is a side view, some parts being shown broken away, and Fig. 3 is a fragmental view of the parts of a composite body assembled previous to being united.

The article shown comprises a tube or cylinder 1 of iron or steel provided on the exterior surface with convolutions, or fins 2, consisting of sheet cooper which are to be united to the cylinder by a weld or joint which is mechanically strong, and also provides for the most complete conductivity of heat from the cylinder to the fins. The good heat-conducting relation is of the particular importance when the copper convolutions function to dissipate heat as when affixed to the exterior of the cylinder of an air-cooled engine.

When carrying out my invention, the fins are formed of sheet copper, which preferably has been rendered immune to the embrittling effect of reducing gas. For example, the copper is treated to remove dissolved oxygen by adding to the copper melt before casting and rolling oxidizable boron material, as described in Weintraub Patent 1,023,604, or by treating the copper by the process described in the Letters Patent No. 1,502,857 issued July 29, 1924.

The sheet copper which may be crimped or fashioned into desired form is attached or welded in place upon the ferrous metal by metal which is readily reduced from the oxide by a reducing gas and which will readily alloy with ferrous and cupreous metal. I have used with good results an alloy consisting of 22 parts copper and 78 parts silver. This alloy melts at about 778° C. Thin strips of this alloy, say, about 4 mils in thickness, are placed between the cylinder 1 and the convolutions 2 of copper at the regions of contact indicated at 3, and are held in place by suitable means, for example, by spacers 4 of iron or the like, which are somewhat tapered longitudinally so that they may be wedged in place by a ring 5. Preferably, asbestos or other suitable non-metallic, protective material is placed about the sides of the spacers, as indicated at 6, to prevent the welding alloy from coming into contact with the spacers 4.

The articles thus assembled are heated in a suitable reducing atmosphere, preferably in hydrogen, to a temperature of about 850° C. Under these conditions the strips 3 melt and the alloy becomes highly fluid and flows into intimate contact with both the ferrous and the cupreous metal which are held under pressure so as to force the surfaces to be welded together. A sound, homogeneous weld occurs so that upon cooling the structure may be treated as a unitary body.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In combination, a hollow cylinder of ferrous metal, and sheet copper fins, immune to the embrittling effect of reducing gas permanently connected to said ferrous metal by a brazing copper-silver alloy having a lower melting point than the copper.

2. The method of joining a body of ferrous metal with a body of cupreous metal

which consists in bringing the regions to be joined while pressed together into contact in a reducing gas with a molten alloy of copper and silver.

3. The method of welding a body of ferrous metal to a body of cupreous metal which consists in causing metal alloying readily with said metal bodies and being reducible from the oxide by a gaseous reducing agent to wet in a fused state the surfaces of said bodies which are to be joined in the presence of said gaseous reducing agent and permitting the wetted parts to cool while under pressure.

4. The method of intimately uniting a body of ferrous metal and a body of copper which consists in treating said copper to remove oxide in order to render the copper immune to the embrittling effect of reducing gas, and thereupon joining said ferrous metal and copper in the presence of reducing gas by a fused metal which will wet both said ferrous metal and copper.

5. The method of intimately uniting a body of ferrous metal and a body of copper, which consists in treating said copper in order to render the copper immune to the embrittling effect of reducing gas, and thereupon joining the said ferrous metal and copper, in the presence of reducing gas, by a fused metal which will wet both said ferrous metal and copper.

6. In combination, a hollow cylinder of ferrous metal, and sheet copper fins immune to the embrittling effect of reducing gas permanently connected to said ferrous metal by a brazing alloy consisting of about 22 parts copper and about 78 parts silver.

In witness whereof, I have hereunto set my hand this 17 day of July, 1922.

WILLIS R. WHITNEY.