M. M. MERRITT.

GALVANOPLASTIC PROCESS AND PRODUCT "A."

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1,282,266. Patented Oct. 22, 1918.

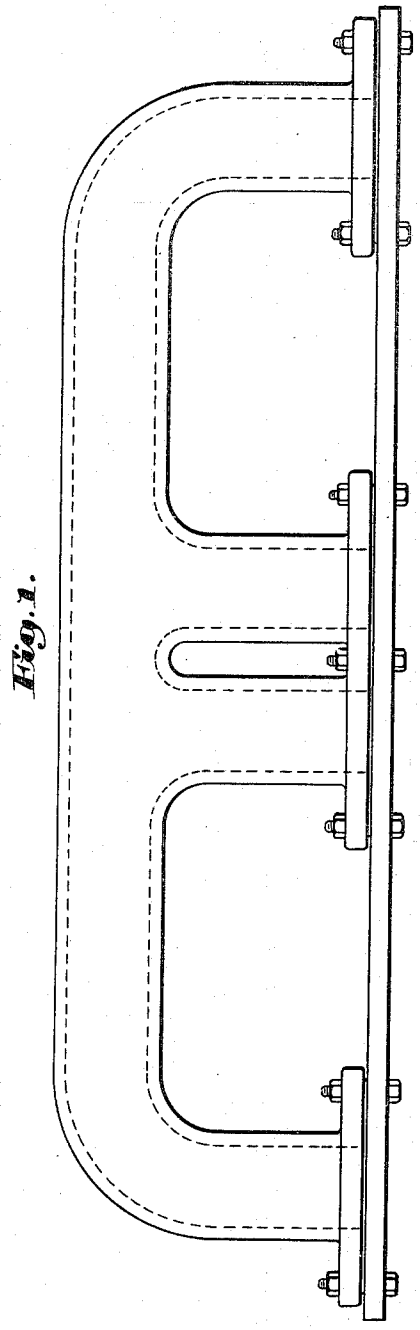


Fig. 1.

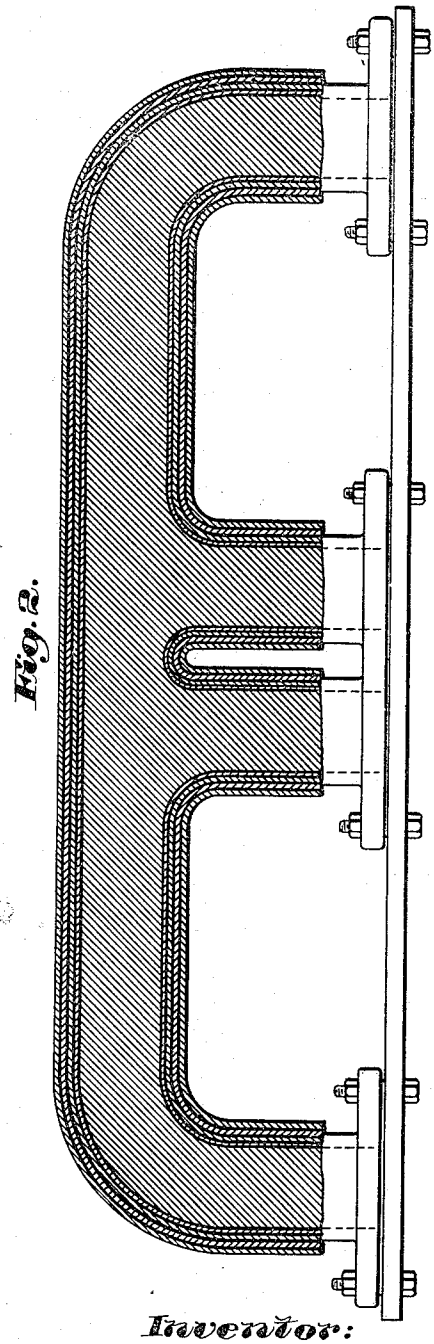


Fig. 2.

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GALVANOPLASTIC PROCESS AND PRODUCT "A."

1,282,266. Specification of Letters Patent. Patented Oct. 22, 1918.

Application filed November 2, 1917. Serial No. 199,810.

To all whom it may concern:

Be it known that I, MATTHEW M. MERRITT, a citizen of the United States, and a resident of South Middleton, county of Essex, Commonwealth of Massachusetts, have invented an Improvement in Galvanoplastic Processes and Products "A," of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention pertains to improvements in galvanoplastic processes and products, but more particularly, though not exclusively, to the manufacture of articles such as manifolds for internal combustion engines such as aeroplane engines.

In the drawings, which show one form of an illustrative embodiment of my invention:

Figure 1 shows a manifold;

Fig. 2 is a diagrammatic section therethrough on the line 2—2 of Fig. 1.

Great difficulty has been experienced in constructing manifolds for aeroplane engines of the requisite light weight which are strong enough to withstand the constant and excessive vibrations occasioned by the operation of the engine. Such manifolds are very likely to develop cracks, particularly adjacent the bent portions thereof. It has heretofore been attempted to manufacture such manifolds by the electrolytic deposit of copper on cathodes of metal fusible at a low temperature, and on cathodes of wax painted with graphite or other electrically conductive material, the core being melted out after the electrolytic deposit. Manifolds made by the usual methods, above-described, have proved unsatisfactory because of brittleness and coarseness of texture of the deposited metal, this brittleness being accentuated at points adjacent curved portions of the deposit.

I have found that the deposits made as before described are rendered more uniform in quality by intermittent immersion of the cathode, as by attaching the same to a revolving wheel partially immersed in the electrolyte so that the entire cathode or a considerable portion thereof, preferably at least one-half, is only intermittently immersed in the electrolyte. This aspect of my invention is not claimed herein being comprised in the subject matter of a copending application Serial No. 247,966, filed August 2, 1918. While intermittent immersion improves the texture of the deposited metal, electrolytic deposits made on metallic cathodes having low melting points are, as heretofore made, likely to be rough and brittle. I believe this to be due to the tendency of certain ingredients of the fusible metal, which is usually an alloy of lead, to be attacked by the electrolyte, and in some instances to be disassociated into negative ions traveling from the cathode to the anode.

Where, on the other hand, the cathode is formed of non-conductive material removable by fusion, by a solvent, or otherwise, and the surface of which is coated with an electrically conductive paint, such as graphite, bronze powder and the like, the deposited copper, as heretofore practised, has been brittle and of slight tensile strength. As stated in my co-pending application, filed herewith, I believe this to be due to the comparatively coarse texture of the conductive coating which is necessarily full of interstices as compared with cast, rolled, or electrolytically deposited metal. The unevenness of attraction exerted by this surfacing of the cathode results in combining the deposited metal in relatively coarse crystalline formation, which renders it brittle and of slight tensile strength.

I have found that the deleterious effects of a cathode composed of metal having a low fusing-point may be minimized by coating the metal with a film of a foreign substance such as grease, and that if a layer of copper, preferably relatively thin, be electrolytically deposited subsequent to the application of the grease and the surface of this metal treated with mercury or mercury amalgam, that subsequent electrolytic deposits on the mercury amalgamated surface will be of fine texture and of great tensile strength, the brittleness being greatly reduced if not eliminated.

If desired, the structure may be laminated by the occasional interruption of electrolytic deposit and the application to the surface of the deposited metal of either a film of grease or a film of mercury amalgam.

Where it is necessary or desirable to utilize a non-metallic cathode such as wax or any electrically non-conductive material removable by a solvent or otherwise, the same being coated with a paint of electrically conductive material, I have found it of great

advantage to deposit a relatively thin sheet of copper or other metal on the electrically conductive surface, to treat this surface with mercury and to continue the electrolytic deposit on the amalgamated surface, the second deposit being very fine-grained and of relatively high tensile strength compared with the initial deposit, and the initial deposit being improved in these respects by the combined effects of the mercury, the electrolyte and the current during subsequent electro-deposition.

In my co-pending application, filed herewith, I have described the utilization of grease for purposes of securing improved electro-deposition, and, if desired, to secure a laminated structure. It is obvious that for some purposes a combination of the use of mercury and of grease may be desirable. I have elected to incorporate in the present application those claims of sufficiently broad scope to dominate both inventions. I have used the word "grease" generically to define any substance capable of forming a film of electrically non-conductive material over the surface on which the metal is to be deposited.

After electro-deposition the core of the cathode may be removed by fusion, by burning, by the use of a solvent or any other suitable method.

I have utilized the word "galvanoplastic" in its broader sense to include any electrolytic processes in which the entire cathode or any portion thereof is removed subsequent to electro-deposition.

It is obvious that the cathode may, if desired, be exterior to the surface thereof on which metal is to be deposited, and that for some purposes my invention may be useful in connection with galvanoplastic processes in which the cathode can be withdrawn without change in the structure thereof.

While I have shown and described one embodiment of my invention and one method of practising the same, it will be understood that major changes may be made, both in the product and the method of producing the same, without departing from the scope of my invention, which is best defined in the following claims.

Claims:

1. A hollow article having a shell formed of a plurality of electrolytically deposited metallic laminæ, said laminæ being separated by a substance having relatively slight adhesive or cohesive properties.

2. A plurality of electrolytically deposited metallic laminæ separated by material having relatively slight adhesive or cohesive properties.

3. A manifold formed of a plurality of electrolytically deposited metallic laminæ, said laminæ being separated by a substance having relatively slight adhesive or cohesive properties.

4. A hollow article having on the interior thereof a layer of granular electrically conductive material, a layer of electrolytically deposited metal exterior to said granular material, said layer of metal having an exterior application of a foreign substance and a second coating of electrolytically deposited metal exterior to said foreign substance.

5. The galvanoplastic process which comprises coating a removable mold or core with an electrically conductive paint, and electrolytically depositing metal thereon while rotating the mold or core under partial submergence in an electrolyte, the direction of rotation being periodically reversed.

6. A manifold having a tubular portion comprising a plurality of superimposed metallic laminæ.

7. A manifold having a tubular portion comprising a plurality of superimposed metallic laminæ, with a foreign substance interposed between said laminæ.

8. A hollow article formed of a plurality of layers of electrolytically deposited metal with a foreign substance interposed between said layers.

In testimony whereof, I have signed my name to this specification.

MATTHEW M. MERRITT.