June 22, 1937. P. R. L. HOGNER 2,084,685

PRINTING PLATE

Filed April 16, 1932

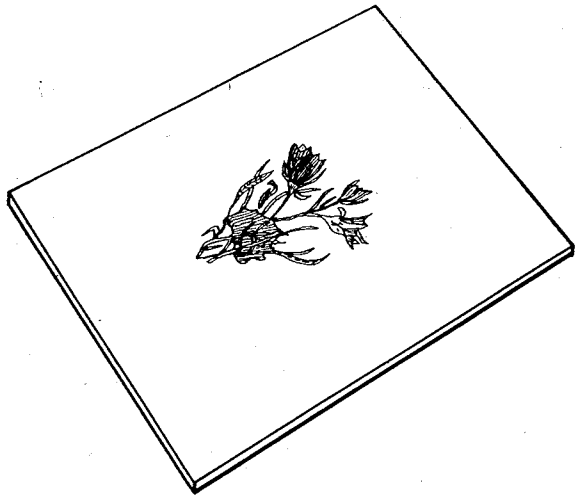

Fig 1

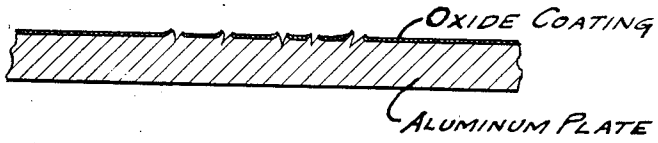

Fig 2

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Patented June 22, 1937 2,084,685

UNITED STATES PATENT OFFICE

2,084,685

PRINTING PLATE

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Application April 16, 1932, Serial No. 605,636

3 Claims. (Cl. 101—401)

This invention relates to improvements in aluminum or aluminum alloy printing plates, such as engraving plates.

The art of printing includes three general types of processes which, depending upon the nature of the surface from which the printed impression is reproduced, may be designated broadly as engraving, lithographing and typographical reproduction. This invention is particularly concerned with the metal plates used in the typographical or letter press printing processes and the engraving processes. The plates, rolls or other forms of printing media used in these processes are generally formed of copper, zinc, or, more recently, aluminum. Because of the relative softness of the metals used for this purpose, the wear on the surface of the plates incident to the reproducing operation, as well as in the ink-wiping step of the engraving process, tends to rapidly efface the design previously produced upon the plate surface and limits the number of satisfactory prints obtainable from each plate. Several methods have been proposed for increasing the useful life of such plates by increasing the wear-resisting qualities of the reproducing surfaces, but no satisfactory means has been proposed for improving the wear-resistance of printing plates formed of aluminum or an aluminum alloy.

It is the object of my invention to provide aluminum or aluminum alloy printing plates having surfaces of substantially increased wear-resistance, and more particularly it is my object to provide aluminum or aluminum alloy engraving plates from which a greater number of satisfactory prints can be made than has heretofore been possible.

In the methods heretofore devised for increasing the wear-resistance of various types of printing plates it has been customary first to produce the desired design upon the face of the plate and thereafter to treat the plate in such a manner that a hard, wear-resisting surface is deposited thereon; for example, by chromium plating the surface. These methods are open to several objections. In many cases, the hard coat is not sufficiently adherent to the surface of the metal to withstand the stresses to which such reproducing surfaces are subject.

I have found that if an aluminum or aluminum alloy plate, and by the term "plate" I mean plate, roll or other similar form, is first provided on its surface with a suitable aluminum oxide coating and the desired design is subsequently produced thereon, the difficulties heretofore encountered are minimized. The printing plate so produced has a hard, adherent surface which is more wear-resistant than aluminum plates heretofore known for this purpose and which may be used in the reproduction of a greater number of copies of the desired design than has heretofore been possible.

In producing the improved aluminum printing plates of my invention, the oxide coatings provided on their surfaces should have an appreciable thickness. By the term "oxide coating" used herein and in the appended claims, I mean, therefore, a layer of aluminum oxide of substantial thickness, such as is produced on aluminum by chemical treatment, either with or without the use of externally applied electrical energy, but it does not include a thin film of aluminum oxide such as is produced on the aluminum surface by contact with air. The term "aluminum" as used herein and in the appended claims includes aluminum and its aluminum-base alloys.

For the purpose of my invention the oxide coating should be characterized by a hardness substantially greater than that of the metal surface itself, by an adherence which will withstand the stresses to which such reproduction surfaces are subjected, and by an elasticity which will prevent chipping of the coating when the plate is subsequently provided with the desired design. For this purpose I have found that methods known in the art of oxide coating may be used, such, for example, as the treatment of the aluminum surface by immersion or otherwise with a solution of an alkali carbonate containing a relatively small percentage of a soluble dichromate, or by anodic oxidation of the aluminum in a suitable electrolyte, such as a solution of sulfuric acid, chromic acid or oxalic acid. I prefer, however, to use an anodic oxidation process, as I have found that harder, more adherent coatings may be obtained thereby.

When anodically coating printing plates in sulfuric acid electrolytes, I prefer making the plate to be coated the anode in an electrolytic cell in which a 5 to 10 per cent solution of sulfuric acid is used as the electrolyte. I then impress upon the anode a current having a current density of 10 to 20 amperes per square foot of anode surface for a period of about 30 minutes, while maintaining the temperature of the electrolyte between 20 and 30° centigrade. Under these conditions I have been able to produce oxide coatings which are particularly hard, dense, and adherent, and which are, consequently, very satisfactory for the purposes of this invention. Quite

satisfactory results may also be produced by anodically coating the aluminum, using as the electrolyte a chromic acid solution containing about 3 to 5 per cent chromic acid or an oxalic acid solution containing about 3 to 5 per cent oxalic acid.

The oxide-coated plate thus produced may then be provided with the design which it is desired to reproduce by any suitable means. Such oxide-coated aluminum plates are particularly suitable for use as engraving plates in the reproduction of etchings produced by the dry point method. In the dry point etching method the design to be reproduced is cut into the face of the plate by means of a sharp instrument. This operation is usually performed by hand by a skilled artisan. The engraving or cutting is done in such a manner that a thin wire edge of metal which protrudes slightly above the surface of the plate is left along one side of the cut. These wire edges or burrs serve as the contact points between the plate and the material to be printed and it is possible to produce satisfactory prints from such engraving plates only so long as these protruding wire edges remain on the surface of the plate. The wear on the plate rapidly removes these wire edges, and in the case of ordinary aluminum plates engraved in this manner about 5 to 10 good prints can be obtained, depending upon the care with which the ink-wiping and reproduction operations are performed, and to some degree upon the nature of the aluminum or aluminum alloy of which the plate is made. However, aluminum plates which have been suitably oxide-coated, when engraved by this method, have a useful life several times as long as that of an uncoated plate of similar metal. The oxide coating, being harder than the metal itself and being flexible and adherent, serves to reinforce the burr and prevent its wearing away.

The following example illustrates the results obtained by my invention when used in connection with aluminum engraving plates. A plate of pure aluminum of commercial grade was anodically coated in a 7 per cent aqueous solution of sulfuric acid, using a current density of 12 amperes per square foot for a period of 30 minutes. The temperature of the electrolyte was maintained at 25° centigrade. A very hard, flexible and adherent coating of aluminum oxide was thus produced on the plate. The oxide-coated plate was then engraved with a suitable design in the usual dry point manner. The engraved plate thus produced was then used in reproducing ten prints of the design. The etching plate, after printing this number of etchings, still retained a good printing surface, showing no substantial effect on the engraved lines, and was in suitable condition for the reproduction of a considerable number of additional prints. A similar aluminum plate which had not been oxide-coated, when engraved in the same manner, was capable of producing less than ten satisfactory prints.

I claim:

1. An improved aluminum engraving plate having a hard, adherent, wear-resisting coating and provided with an intaglio design the lines of which are defined along one edge by raised portions of metal, said raised metal edges being reinforced by said coating.

2. An improved aluminum engraving plate provided on its surface with a hard, elastic and adherent coating consisting substantially of aluminum oxide and having impressed thereon an intaglio design the lines of which are defined by raised portions of metal along their edges, said raised metal edges being rendered wear-resistant by said aluminum oxide coating.

3. An improved aluminum engraving plate provided on its surface with a hard, elastic and adherent coating consisting substantially of aluminum oxide and having impressed thereon an intaglio design.

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