

# UNITED STATES PATENT OFFICE.

STANLEY L. WALTER AND FREDERICK W. KEINER, OF EKASTOWN,  
PENNSYLVANIA.

## PROCESS OF HARDENING COPPER.

SPECIFICATION forming part of Letters Patent No. 701,429, dated June 3, 1902.

Application filed November 2, 1900. Serial No. 35,266. (No specimens.)

*To all whom it may concern:*

Be it known that we, STANLEY L. WALTER and FREDERICK W. KEINER, citizens of the United States, residing at Ekastown, in the county of Butler and State of Pennsylvania, have invented a new and useful Process for Hardening Copper, of which the following is a specification.

This invention relates to a process of treating copper whereby the same is hardened.

The object of the invention is in a simple, thoroughly practical, and feasible manner to effect intimate combination between copper and aluminium, the product being an alloy that shall be hard, resilient, and capable of receiving and retaining a high finish.

A further object is to effect a perfect alloy of the two metals without agitation or stirring while in a molten condition and without the employment of a superposed flux as a reducing agent.

A further object is in a positive manner to prevent oxidation, whereby the formation of the alloy is expedited and the perfect combination of the elements thereof is assured.

With these and other objects in view, as will appear as the nature of the invention is better understood, the same consists in the novel process of hardening copper, as will be hereinafter fully described and claimed.

In carrying out the process there is taken of the following ingredients by weight: copper, thirty-two parts; aluminium, five parts; powdered charcoal, one part. The aluminium and charcoal are first placed in a suitable crucible or furnace, and the copper is then added as a superposed mass. Heat is then applied to the crucible to fuse the metals, causing ignition of the charcoal, the carbonic-acid gas from which passes upward through the copper, carrying off any moisture contained in the metals and forming above the crucible a cushion of highly-heated gas that will operate effectively to preclude entrance of atmospheric air to the crucible, thereby obviating any possibility of oxidation of the metal, whereby an intimate combination

thereof will ensue. By reason of the fact that the copper is placed on top of the aluminium it will by its greater specific gravity and upon fusion sink down upon and become thoroughly combined or incorporated with the aluminium without requiring any mechanical agitation or stirring to produce the required combination. The resulting alloy possesses qualities of toughness and closeness of fiber that will render it valuable in arts requiring a metal possessing these qualities and the added quality of being non-oxidizable in character.

In the practicable employment of the process a superior article of hardened copper has been produced by employing the proportions of the ingredients above stated; but it is to be understood that such proportions may be varied—that is to say, a greater proportion of aluminium to copper or of charcoal to both may be employed without departing from the spirit of the invention.

Having thus fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

The herein-described method of hardening copper, which consists in placing aluminium and charcoal in a crucible, supplying to the crucible a superposed mass of copper, and then applying heat to the crucible, causing thereby combustion of the charcoal and generation of carbonic-acid gas which passes upward through the copper, carrying off any contained moisture in the metals and at the same time preventing oxidation thereof, whereby upon fusion of the metals, the copper, owing to its superior specific gravity, will intimately combine with the aluminium presenting thereby a hardened copper alloy.

In testimony that we claim the foregoing as our own we have hereto affixed our signatures in the presence of two witnesses.

STANLEY L. WALTER.  
FREDERICK W. KEINER.

Witnesses:

J. W. GARNER,  
MAY C. GLADMOND.