

UNITED STATES PATENT OFFICE.

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PRODUCTION OF ALLOYS OF COPPER, SUCH AS BRASS.

943,159.

Specification of Letters Patent.

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No Drawing.

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To all whom it may concern:

Be it known that we, SYDNEY CAPEL PECK and WILLIAM RICHARD HODGKINSON, F. R. S. E., subjects of the King of England, residing in London, England, have invented certain new and useful improvements in the Production of Alloys of Copper, Such as Brass, of which the following is a specification.

This invention relates to improvements in the production of alloys of copper such as brass, bronze, cupro-nickel and the like.

The object of the invention is to improve the qualities of such alloys for certain purposes by the introduction into the alloys of additional constituents. Thus, for example, it is found that the introduction of various small proportions of chromium, manganese, nickel, cobalt, or zinc may alter the properties of the resulting alloy, and in certain cases render the alloys considerably more useful for certain purposes.

According to this invention, in introducing a metal into a copper alloy such as brass, a portion of the alloy metal may be heated with a reducing agent, such as carbon, and a phosphate of the metal to be introduced, so as to produce a metallic solution of the phosphid of the metal to be introduced and thereafter this solution of phosphid may be added in any desired proportion to the molten alloy.

Metals which may be introduced into the alloy are, for example, chromium, manganese, nickel or zinc.

The following is a description, by way of example, of one method of carrying this invention into effect for the purpose of producing a brass containing a small proportion of chromium. Chromium phosphate is intimately mixed with a reducing agent such as powdered charcoal, pitch or the like, and this mixture is heated with metallic copper, brass or like alloy, the proportions and the temperature being such as to effect the reduction of the chromium phosphate to chromium phosphid which is dissolved in the copper, brass or like alloy. This copper or metal solution of chromium phosphid is then added in the required proportion to the molten brass. In this second operation, some phosphid of zinc is formed and volatilized, leaving a brass (or copper zinc alloy) containing metallic chromium, and, it may be, some traces or small quantities of phosphid. By such a method it is possible to increase

the ductility and tensile strength of the brass or otherwise to vary its properties.

It is to be understood that the details of the process and the proportions of the ingredients may be varied without departing from this invention. For example, the reduction of the metallic phosphate and the introduction of the resulting phosphid into the alloy may both take place in one operation or a concentrated solution of metallic phosphid in brass or other alloy metal may be first prepared.

The following is a description in detail of an actual test of the process embodying this invention. 2600 grams of brass (copper 70%, zinc 30%) were melted in a crucible together with 200 grams of a mixture of equal parts of chromium phosphate and powdered charcoal and the whole mass kept at a temperature of about 1000° C. After the lapse of an hour another 200 grams of the above mixture was added and again after another hour another 200 grams was added. Four hours after the first melting the metal was cast in an iron mold. During the above process the whole was thoroughly stirred every half hour with a piece of wood. The metal produced in the above manner contains chromium phosphid and was thus made use of to improve the qualities of brass:—1516 grams of copper were melted in a crucible and 655 grams of zinc and then 82.5 grams of the chromium phosphid brass were added and the whole thoroughly stirred and then after twelve minutes was cast in a round iron mold. The metal thus produced when tested gave a tensile strength of 19 tons per square inch and an elongation of 72% on two inches. Brass made of the same sample of copper and zinc in the same proportions and under exactly similar conditions but not treated with the chromium phosphid metal has a tensile strength of 14.4 tons per square inch and an elongation of 38.5% on two inches.

What we claim as our invention and desire to secure by Letters Patent is:—

1. The hereinbefore described method of treating a copper alloy by the introduction thereto of another metal which consists in heating a portion of the alloy metal with a solid reducing agent and the phosphate of the metal to be introduced, collecting the metallic phosphid thus produced, heating a mass of the alloy to a molten state and adding to it the metallic phosphid.

2. The hereinbefore described method of treating a copper alloy by the introduction thereto of another metal which consists in heating a portion of the alloy metal with a solid reducing agent and phosphate of chromium, collecting the metallic phosphid thus produced, heating a mass of the alloy to a molten state and adding to it the metallic phosphid.
3. The hereinbefore described method of treating a copper alloy by the introduction thereto of another metal which consists in heating metallic brass with chromium phosphate and powdered charcoal, collecting the brass solution of chromium phosphid thus produced, heating a mass of the alloy to a

molten state and adding to it the required amount of the phosphid solution.

In testimony whereof we have signed our names to this specification in the presence of the subscribing witnesses.

SYDNEY CAPEL PECK.

WILLIAM RICHARD HODGKINSON.

Witnesses to signature of Sydney Capel Peck:

HARRY B. BRIDGE,

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WILLIAM H. BALLANTYNE,

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