UNITED STATES PATENT OFFICE.

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COMPOSITION OF METALS.

SPECIFICATION forming part of Letters Patent No. 309,011, dated December 9, 1884.

Application filed December 14, 1882. (Specimens.)

To all whom it may concern:

Be it known that I, JOHN A. TOBIN, United States Navy, a citizen of the United States, residing at Nayatt Point, in the county of Bristol and State of Rhode Island, have invented certain new and useful Improvements in Composition of Metals; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to certain improvements in composition of metals, also in the process of combining said metals for the purpose of producing homogeneous alloys, which are non-corrosive, suitable for casting or rolling, having great tensile strength and toughness, combined with durability and ductility, which can be bent into any shape either hot or cold, forged into bolts, &c.

The essential elements of my alloy are copper, zinc, and tin, preferably combined in the exact proportions hereinafter stated, and, if desired, purified or deoxidized by means of additions to the molten metal of phosphorus, phosphates, or similar substances, including well-known fluxes, for the purpose of improving the homogeneous nature of the finished product.

I find from actual practice that owing to certain peculiarities of my metal it is specially adapted for piston-rings and other rubbing-surfaces, such as the wearing-faces of slide-valves, cross-head guides, and linings for pump-cylinders; also, owing to its non-corrosive character, it is eminently suitable for any part of an engine in which the metal comes in contact with sea-air, sea-water, or chemical vapors. Owing to the great strength and comparative low cost; these alloys can be economically employed in making shafting for launch machinery, tubing, plates, and sheathing for vessels, torpedo-boats, boiler-plates, rods, rivets, castings for bronzes, angle-bars, lightning-rods, and wires, including telegraphic and telephonic wire, for which it is peculiarly adapted on account of its nature as a conductor of electricity and ability to withstand strains, thereby obviating sagging when the poles are spaced at long distances. These alloys are also peculiarly adapted for the manufacture of cotton-ties, teeth, hooks, or similar devices employed in handling or manipulating cotton or analogous purposes, as a substitute for iron or other metals where metal is liable to endanger property by "striking fire."

After a long series of experiments I have discovered that certain proportions of the metals above named possess remarkable characteristics, which are not found in any of the individual metals composing the alloys, and, in fact, not possessed by any other metal or composition of metals known.

The particular features which I have discovered as adapting the metal compound referred to for economic purposes are substantially the enormous tensile strength and power of resisting strains, combined with a remarkable density and ductility and other features in connection with the strength, which render the composition specially adapted for the uses herein detailed.

For the production of one of my high-test alloys I take, for example, 58.22 parts of copper, 39.48 parts of zinc, and 2.30 parts of tin, and preferably melt the tin and copper separately, and then mix the two, and finally add all the zinc, care being taken during the melting operation to provide a reducing atmosphere or otherwise avoid contact of the air, as well as volatilization of the constituent elements of the alloy.

The metals, when thoroughly combined by stirring, may be poured into sand or metal molds.

The variety and purity of the metals used and the method of combining the same are subject to certain variations; but owing to the impurities contained in the metal and the tendency of the molten charge to absorb gases I find that in all compositions of copper, zinc, and tin, when there is a doubt about the purity of either metal, it is essential to the best results that phosphates or silicious fluxes, or both, should be added to the molten bath to thoroughly deoxidize and purify the metals. The percentage proportion of the three metals above given indicates merely a typical formula, and it is evident that the tin may be reduced two parts or any fraction of the amount

named used; also, the proportion of copper and zinc may be changed, provided the metals are purified in the manner above described. For example, the copper can be diminished or increased two to eight parts, and the zinc changed in the same manner, while the tin remains substantially the same, or the tin can be increased or diminished, but in all cases within certain limits.

I find that the carefully purified and deoxidized compositions of copper, zinc, and tin are phenomenally tough. They are also bright in color, and not easily tarnished, and, as above stated, approximate the remarkable qualities of the typical formula.

In all the combinations of copper, zinc, and tin possible for general mixture I obtain the best practical results by combining with said triple alloy either phosphates, silicon, including amorphous or other forms of phosphorus, which may be used in place of or with the phosphate of tin or said purifying reagents.

To more fully illustrate the economical results of my discovery, I desire to specifically refer to the specimens which form a part of this application which were produced under my supervision. These specimens, which are malleable and ductile, were rolled from an alloy of the composition defined in my typical formula, and were found to stand the test applied, as follows: Specimen marked "No. 1" was rolled from a cast bar, the length of said bar being about twelve inches, and having a diameter of one and three-quarter inch. Specimen marked "No. 2," rolled from a cast bar of about the same size, was annealed and bent cold. Specimen marked "No. 3" is a sample of the same melt and composition unannealed, which, when tested for tensile strength, stood a strain of sixty-five thousand three hundred and forty-two pounds per square inch. The same metal in the annealed state gave by several tests the remarkable result of withstanding strains of seventy-one thousand six hundred and eighty pounds per square inch. Previous tests, when cold-rolled, withstood a tensile strain of fifty-two tons to the square inch.

What I consider as my invention, and desire to secure by Letters Patent, is—

1. The process of producing homogeneous alloys possessing the features described, which consists in melting copper, zinc, and tin, thoroughly commingling the molten mass by mechanical agitation, and finally adding to said mixture a deoxidizing agent, substantially as set forth.

2. The homogeneous and ductile bronze alloy herein set forth, consisting of copper, zinc, and tin combined, as and in the proportions specified.

In testimony whereof I hereby affix my signature in presence of two witnesses.

JOHN A. TOBIN.

Witnesses:

JAMES H. HART,

H. G. LEOPOLD.