UNITED STATES PATENT OFFICE.

FRANK. G. STARK, OF ST. LOUIS, MISSOURI, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE CARBO-ALUMINA METAL COMPANY, OF SAME PLACE.

ALLOY OF METALS AND PROCESS OF MAKING SAME.

SPECIFICATION forming part of Letters Patent No. 490,174, dated January 17, 1893.

Application filed July 29, 1892. Serial No. 441,600. (Specimens.)

To all whom it may concern:

Be it known that I, FRANK. G. STARK, a citizen of the United States, residing in the city of St. Louis and State of Missouri, have invented certain new and useful Alloy of Metals and an Improvement in the Process of Making Same, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention consists in an alloy of certain metals and the process of making the same, which will hereinafter be described, the product of which has the peculiar properties of malleability and flexibility, with an external appearance, when taken from a crucible, of gilded brass.

The process of making and the composition of the alloy is as follows: For convenience of illustration, I will describe an alloy of ninety-nine [99] parts, but it is obvious that the proportion of these parts may be changed to increase the toughness and flexibility, or to form a friable and brittle alloy as may be desired.

From practical tests and experiments, I have found the best resulting product, that which has the properties of tensile strength, flexibility and toughness, to be derived from an alloy containing: copper, fifty-six [56] parts; zinc, forty [40] parts; iron, two [2] parts; aluminum, one [1] part. The copper is first placed in a suitable crucible, or other fusing furnace, and subjected to a heat of about two thousand [2,000] degrees Fahrenheit until it is in a molten state. The zinc, which is susceptible of being fused at a less degree of heat is then added, a small proportion of the whole amount [say about one-fifth] at a time, the molten copper, in the meanwhile, being constantly agitated, until the zinc is thoroughly melted and diffused throughout the copper. This operation of addition of the zinc to the copper is continued until the whole amount is introduced, melted and thoroughly mixed. The molten metal is then left for a short time, to enable the mixture to again reach its high degree of temperature, which has been reduced by the introduction of the cold zinc, and the iron filings are added, which being such a small proportion of the whole amount, are introduced in bulk. The molten metal is again thoroughly stirred, approximately two minutes, in order that the iron filings may be thoroughly disseminated throughout the molten mass. The temperature of the mass being below the fusing point of iron, will leave the iron intact, permitting the iron in its finely divided state to come in contact with the whole mass, thereby producing the desired chemical change. The whole mass is then left inactive for a short space of time [about five minutes], after which the aluminum is added, care being taken, however, to hold the same beneath the surface until a whitish blue flame, peculiar to burning aluminum, is perceptible, when the whole mass is stirred vigorously and rapidly until the aluminum is thoroughly mixed. After a space of about five minutes, the metal is ready for pouring, or, should it be desirable to leave it in the crucible or furnace for a longer period, charcoal, or other carbonaceous matter, may be used, in the usual way, to prevent oxidation of the zinc.

The product of the "heat," as before stated, may be either formed into ingots, or poured immediately, which, if the latter be done, the resultant casting, when taken from the mold, will present a smooth surface free from the general "sponge" or "honey-combed" appearance which is common to castings near or around the gate. The color is a bright yellow, having the appearance of being frosted or gilded.

Should it be desired to turn or plane the surface, this may easily be done, without injury to the fiber, as can, also, the polishing, or burnishing, operation which the metal will take readily, being liable to tarnish to a less degree than brass. It is susceptible of being heated to a red heat, for the purpose of forging, and, unlike brass, in this respect, will not crumble.

It is flexible to a great extent, and, when bent to such a degree beyond its flexibility, it will prove ductile, and will not snap, or break, easily.

From experiment, it has also proved itself to be susceptible of being cold-rolled, or twisted, and may be bent upon itself, without materially affecting the strength of its fibers.

To make the alloy more brittle, I increase the proportion of iron in relation to the proportions of other metals used in the alloy, and, to make the alloy more ductile and tough, the proportion of iron is decreased, relatively.

Having thus described my invention what I claim and desire to secure by Letters-Patent of the United States is:

1. As a new article of manufacture, an alloy composed of fifty-six [56] parts, copper, forty [40] parts zinc, two [2] parts iron, and one [1] aluminum, or substantially the proportions as above set forth.

2. The process herein-described, of forming an alloy of copper, zinc, iron, and aluminum, which consists in fusing the copper, adding and thoroughly mixing the zinc in small proportions at a time, adding the iron in a finely divided state and thoroughly stirring it into the molten mass, and, finally, introducing the aluminum, in about the proportions hereinbefore stated and commingled as described.

In testimony whereof I have affixed my signature, in presence of two witnesses, this 23d day of July, 1892.

FRANK. G. STARK.

Witnesses:
PAUL BAKEWELL,
A. RAMEL.