

# UNITED STATES PATENT OFFICE.

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## MANUFACTURE OF ALLOYS OF COPPER AND IRON.

SPECIFICATION forming part of Letters Patent No. 577,182, dated February 16, 1897.

Application filed April 22, 1896. Serial No. 588,535. (Specimens.)

*To all whom it may concern:*

Be it known that I, AIMÉ FÉLIX VICTOR MARIE BARON, a citizen of the Republic of France, residing at Paris, France, have invented a new and useful Improvement in the Manufacture of Alloys of Copper and Iron, of which the following is a specification.

Many attempts have heretofore been made to produce alloys of copper and iron or copper and one of the alloys of iron. Such alloys have been produced in isolated laboratory experiments, and the few physical tests that have been made have proved that they are both hard and tenacious. The difficulty encountered by all experimenters, however, is that when the two metals are melted together or melted separate and mixed in a melted condition, or an attempt made to dissolve iron in a bath of copper, they do not produce a homogeneous alloy, and the resulting ingots exhibit segregation to such a degree as to render the product unreliable and unfit for general use in the arts. Further, it has been also found impossible to obtain a homogeneous alloy of copper and iron containing a predetermined amount of each metal, for the reason that the metals when heated are subjected to oxidation to such an indefinite extent that the alloy produced will upon assay show that the relative proportion of the two metals has been materially altered.

For the above reasons copper-iron alloys have never been made use of in mechanical constructions.

The object of my invention is to produce a homogeneous alloy of the two metals, copper and iron, and in definite predetermined proportions, and thus realize the practical manufacture of a product which, while it has the general characteristics of copper, is by the addition of the iron given other characteristics, among which are hardness and tenacity.

To carry my invention into effect, I use crucibles, preferably graphite, or any proper melting-furnace. The copper is placed in the crucible or furnace, and when it has reached a heat which may vary between cherry and very bright red I add to it a certain quantity of a mixture consisting of oxalic acid and resin. I preferably use about two-thirds oxalic acid to about one-third resin; but this

proportion need not be strictly adhered to, as a considerable deviation from it does not prevent useful action. When the copper is melted, I introduce the iron in the required proportion, either hot or cold, but preferably hot.

By the term "iron" I wish to be understood as referring to the iron of trade or the alloys of iron and carbon, such as are commonly known as "steel" or "cast-iron." I have obtained useful results by the addition of fifty grams of the above-described mixture of oxalic acid and resin to one hundred kilograms of alloy; but this proportion may be considerably departed from, even to doubling the quantity of the described mixture, without injury to the result, the action, in my opinion, being simply by presence and not by chemical combination; or, in other words, the function of the mixture—at least its partial function—is to produce an atmosphere which prevents oxidation of the iron and copper, and thereby permits the iron to be dissolved in the copper, forming what may be termed a "solidified solution of iron in copper," or otherwise a homogeneous copper-iron alloy.

The alloy may contain small proportions of various metals in addition to the iron without affecting the action of the mixture, or other metals may be added when the special qualities which they impart are desired. I, however, wish it understood that my invention contemplates the direct solution of iron in copper and that any indirect method—such, for instance, as the solution of iron in zinc and the subsequent mixture of such alloy with copper—is not within the principle embodied in my invention.

In this manner I produce an alloy containing copper and iron in certain definite fixed proportions, these proportions varying according to the required physical qualities of the finished product. Thus, if a soft metal is wanted, the proportions would be about as follows: copper, ninety-five per cent.; iron, five per cent. The resultant metal or alloy will become tougher and harder as the proportion of iron is increased, until, when it reaches fifty per cent., an alloy will be produced of exceeding hardness. The alloy thus obtained may be rolled or drawn into wire



with greater or less facility, according to the proportion of iron. It may also be cast into shapes.

I am aware that it has heretofore been suggested to alloy iron with copper for the purpose of adding a new characteristic to the iron and for the purpose of improving the quality of the iron. Such attempts, however, have not proved successful and have not, so far as I am aware, gone into general use, and, further, such is not the purpose of my invention, which, as previously stated, is to produce a new product which shall be a solidified solution of iron in copper, have the general characteristics of copper, and which is capable of being treated in the manner of copper and useful as a substitute for copper, but which shall also have other characteristics not possessed by copper, but approaching nearer to those of iron.

I make no claim in this application to the product herein described, as the same has been made the subject of a separate application, filed December 10, 1896, Serial No. 615,203.

What I claim is—

1. The process of producing a homogeneous alloy of copper and iron, which consists in subjecting the copper to heat, until it becomes of a cherry or very bright red, and subsequently adding the required quantity of a mixture composed of a resin and oxalic acid,

and finally adding the required quantity of iron.

2. The process of producing a solution of iron in copper, which consists in effecting said solution by heat, and in the presence of carbon monoxid, carbon dioxid and water produced by the decomposition of an oxalate or other similar organic salt.

3. The process of producing a homogeneous alloy of copper and iron, which consists in adding to the metals, when subjected to heat, a mixture composed of a resin and an oxalate or other similar organic salt, which on decomposition by heat, evolves carbon monoxid, carbon dioxid and water.

4. The process of producing a homogeneous alloy of copper and iron, which consists in subjecting the copper to heat, until it becomes of a cherry or very bright red, and subsequently adding the required quantity of a mixture composed of a resin and an oxalate or other similar organic salt, which on decomposition by heat evolves carbon monoxid, carbon dioxid and water, and finally adding the required quantity of iron.

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

AIMÉ FÉLIX VICTOR MARIE BARON.

Witnesses:

F. R. COUDERT, Jr.,  
CHARLES A. CONLON.