

# UNITED STATES PATENT OFFICE.

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## PROCESS OF MANUFACTURING ALLOYS OF COPPER AND IRON.

SPECIFICATION forming part of Letters Patent No. 755,461, dated March 22, 1904

Application filed June 30, 1903. Serial No. 163,808. (No specimens.)

*To all whom it may concern:*

Be it known that I, JAMES D. DARLING, a citizen of the United States, residing at No. 4826 Greenway avenue, in the city and county  
5 of Philadelphia and State of Pennsylvania, have invented a certain new and useful Process for the Manufacture of Alloys of Copper and Iron, whereof the following is a specification.

Alloys of these two metals are known to  
10 possess valuable properties; but their practical use has been restricted, owing to the difficulty of producing a true alloy as distinguished from a mere mixture of the constituent metals.

I have found that by the use of the method  
15 hereinafter set forth true alloys of iron and copper can be commercially produced and that the ultimate percentages of the ingredients can be controlled so as to yield any predetermined product of a thoroughly homogeneous  
20 character.

As typical of the process I will now proceed to describe the application thereof to the production of an alloy containing equal parts of each metal.

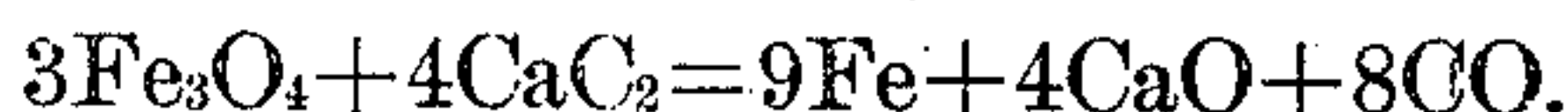
25 I first prepare a bath by melting in a crucible or any other suitable receptacle or furnace a quantity of metallic copper equal to half the total amount of alloy intended. I then add thereto an intimate mixture of finely-ground  
30 ferric oxid and calcium carbid in a quantity slightly exceeding the theoretical proportions according to the formula



35 I have found that, say, eighteen parts of this mixture should be used for eight parts of the metallic copper in order to produce a fifty-per-cent. alloy, this excess over the theoretical amount allowing for possible impurities and  
40 for loss. The mixture of oxid and carbid is preferably added from time to time in relatively small quantities, the bath being stirred as the operation proceeds, and the temperature should be gradually increased to produce the  
45 best results, owing to the fact that the increasing percentage of metallic iron, due to

the reduction of the oxid, tends to raise the melting-point. When the reaction is complete, the contents of the crucible may be poured into ingots or other desired forms, 50 either as an ultimate product, which may be employed as a basis for further alloys, or as an ultimate article of manufacture suitable for any purpose for which castings of this character may be desirable. I believe that the 55 homogeneity of the alloy is largely due to the fact that the iron is presented to the copper in a nascent condition and finely-divided state and that the presence of oxids which would tend to prevent an intimate union is substan- 60 tially avoided.

As an initial material I may employ the black or magnetic oxid of iron instead of the red oxid above mentioned, the mixture being thus constituted according to the formula 65



This reaction requires less carbid for a given amount of metallic iron and may therefore be advantageous under some circumstances. 70

If an alloy very high in iron is to be produced—say, for instance, one containing eighty-five per cent. of that metal to fifteen per cent. of copper—I may proceed by first melting the proper amount of iron (obtaining 75 the bath as free as possible from carbon) and then add the copper-containing ingredient in the form of a mixture of cupric oxid and calcium carbid finely ground, the proportions of the mixture itself being constituted according 80 to the formula



Having thus described my invention, I claim— 85

1. The hereinbefore-described process for the manufacture of alloys of copper and iron, which consists in preparing a melted bath of one of said constituents in metallic form and adding thereto a mixture of an oxid of the 90 other constituent metal with calcium carbid, substantially as set forth.

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2. The herei before-described process for the manufacture of alloys of copper and iron, which consists in preparing a bath of melted copper and adding thereto a mixture of an  
5 oxid of iron with calcium carbid, substantially as set forth.

In witness whereof I have signed my name

to this specification, this 20th day of June, A.D. 1903, in the presence of two subscribing witnesses.

JAMES D. DARLING.

Witnesses:

JAMES H. BELL,

M. K. TRUMBORE.