

UNITED STATES PATENT OFFICE.

CHARLES J. A. DICK, OF LEYLAND ROAD, LEE, AND GEORGE A. DICK, OF LONDON, ENGLAND, ASSIGNORS TO SAID CHARLES J. A. DICK.

METALLIC ALLOY.

SPECIFICATION forming part of Letters Patent No. 228,615, dated June 8, 1880.

Application filed June 23, 1879.

To all whom it may concern:

Be it known that we, CHARLES JAMES ADOLPH DICK, of Leyland Road, Lee, in the county of Kent, and GEORGE ALEXANDER DICK, of 110 Cannon street, London, England, have invented a new and useful Improvement in Metallic Alloys, of which the following is a specification.

Our invention consists of improved alloys or compounds of wrought-iron or of mild steel—that is, steel containing a proportion of carbon not exceeding the proportion found in wrought-iron, with phosphorus and tin, and with or without the addition of lead. We have found that by heating scraps of wrought-iron or mild steel, or also iron-sponge, in a covered crucible to bright red or white heat, and then adding thereto a proportion of tin or phosphuret of tin, as the case may be, and as is hereinafter fully specified, the iron will be completely melted down or dissolved in a short time, and the resultant alloy or compound, being very fluid, is applicable for making fine castings of considerable strength, and is also well adapted for bearings or journal-boxes. We improve the quality of said alloy by the addition thereto of a proportion of lead, and greatly increase the toughness and ductility of the castings made from the latter compound by subjecting the same while at a red heat to the process of annealing, especially if the casting has been made in a chill-mold. We have found that the compound with lead, as above, is excellent material for bearings and other like purposes.

The iron or steel used in the manufacture of the compounds should be free, or very nearly free, from combined carbon; otherwise the product would be brittle and worthless. A like effect would be produced by the admixture of any appreciable quantity of graphite or free carbon. The presence of phosphorus in compounding the above alloys is necessary, as it renders the same liquid and greatly improves their uniformity, soundness, and strength.

More or less phosphorus may be contained in the iron or steel used, and the application of more phosphorus may be made, when necessary, by the addition of phosphuret of tin;

or the iron or steel may be free from phosphorus; which should be entirely furnished by phosphuret of tin in proper proportions, which latter mode of manufacture offers the advantage of great uniformity in the product and of a rapid reaction and melting of the iron, which is of importance, owing to the tendency of tin to become vaporized at high temperatures.

When using the well-known iron-sponge obtained by direct reduction of iron ore, instead of wrought-iron scrap, in the manufacture of said alloys, the reaction and the melting of the particles of metallic iron in said sponge, upon the introduction of the tin or phosphuret of tin, are very rapid, and the use of iron-sponge offers the further advantage of a vitreous slag, being naturally formed by the melting of the earthy impurities contained in the sponge, which slag protects the melting or molten compound in the crucible against the action of the atmosphere. When using wrought-iron or steel scrap we introduce a similar slag into the crucible for the same purpose. When using phosphurets of tin, in perfecting the alloys, with pure iron or iron containing an insufficient component quantity of phosphorus, as above stated, we adopt such phosphurets as contain from five to fifteen, or more, per cent. of phosphorus, and it is essential that the total component quantity of phosphorus in the perfected alloy or compound shall exceed a proportion of five per cent. relatively to the component quantity of tin, and shall not exceed a proportion of two per cent. relatively of the component quantity of iron in the same. The presence of small quantities of carbon in the compound renders it necessary to reduce the proportion of phosphorus, which could otherwise be advantageously used, as the resulting alloy thereby becomes hard and brittle. The lead is added in the crucible, either together with the tin or phosphuret of tin, or afterward, and the whole compound remains exposed to the action of heat for a sufficient length of time to allow of an intimate and uniform mixing or combination of the different ingredients. The metal is then run into ingots, ready for use. It may be remelted in an ordinary furnace, and without any material alteration in its com-

ponent proportions, and it may be cast in sand or in chills at a low temperature.

We have found that for the production of useful alloys the maximum quantity of tin should not exceed ten per cent. of the perfected alloy, and if in connection with lead the total quantity of tin and lead together should not much exceed the same proportion, in order that it may properly and uniformly combine and remain mixed with the iron or alloy of iron and tin formed in the whole body of the casting. We have found that a good alloy for bearings can be made by combining ninety-two per cent. of iron, one per cent. of phosphorus, three and one-half per cent. of tin, and three and one-half per cent. of lead. We do not, however, limit ourselves to these proportions; but

We claim as our invention—

1. The within-described process of making a fusible alloy or compound of wrought-iron, tin, and phosphorus, with the addition of lead if desired, the said process consisting in heating scraps of wrought-iron, mild steel, or iron-sponge, and adding tin and phosphuret of tin, with the addition of lead when desired, all as set forth.

2. The within-described fusible alloy or compound, the same consisting of wrought-iron or mild steel, tin, and phosphorus, as specified.

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

CHARLES JAMES ADOLPH DICK.
GEORGE ALEXANDER DICK.

Witnesses:

SAMUEL CARL EDUARD DE BARY,
GEO. HENRY FUNCK.