UNITED STATES PATENT OFFICE.

LOUIS C. DODD, OF BUFFALO, NEW YORK.

ALLOY AND METHOD OF MAKING SAME.

971,669. Specification of Letters Patent. Patented Oct. 4, 1910.

No Drawing. Application filed January 19, 1907. Serial No. 353,065.

To all whom it may concern:

Be it known that I, LOUIS C. DODD, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented a new and useful Alloy and Method of Making Same, of which the following is a specification.

It is well known to all versed in the art of making or compounding bearing metals, that a copper-lead alloy is the best alloy for bearing purposes. Especially so for bearings subjected to heavy loads, and especially where it is required that the bearing should conform itself, in a limited degree, to both the journal and its seat, that is, have malleability or plasticity. It is also known that a high percentage of lead in an alloy renders it to a greater degree proof against the destructive action of acids, alkalies and chemicals. The difficulty in alloying copper and lead is due to their great difference of melting temperature, their slight affinity for each other and their difference in specific gravity. The copper in the molten mixture of lead and copper tends to solidify while the lead remains molten and owing to its higher specific gravity tends to settle to the bottom. It is also known that the lead and copper are only a mechanical mixture and that at best the lead is suspended in a matrix of copper; now, the object of my invention is to accomplish this suspension more perfectly than has ever been done before, that is, hold a larger percentage of lead in suspension in a more finely divided state in a less expensive manner than heretofore.

I attain my object by introducing a relatively small percentage of iron into the molten copper. The iron should be as pure and as free from carbon as possible, and is introduced while the copper is in a molten state, after which the relatively high percentage of lead is then added. The iron should not exceed three per cent., and the lead should not be in excess of fifty per cent. Both copper and lead in the pure state have very little affinity for each other and for that reason they readily separate when cooling from a molten mixture. The reason for having the iron present in this alloy is that when cooling the iron sets quickly owing to its relatively higher fusing point, and thus owing to its presence retains the lead in suspension.

The addition of manganese to this alloy has a very beneficial effect, owing to the high affinity, which manganese has for both the iron and the copper, its presence, therefore, causes the iron to be more finely divided throughout the bath of molten copper, wherefore, after the lead has been introduced, the suspension of the lead in the mass when cooling, becomes even more intimate than without the addition of manganese, it also increases the carrying capacity for lead from thirty to fifty per cent. The most convenient way for the introduction of manganese is to first alloy the manganese with the iron. This can be done very conveniently by first melting together a tempering alloy composed of practically equal parts of Norway or Swedish iron, (or an iron nearly free from carbon), with an eighty per cent. commercial ferromanganese. The presence of an unnecessary amount of iron or manganese in a bearing is undesirable, and for that reason only the necessary amount of tempering alloy should be added in order to properly maintain perfect suspension of the lead in the mixture during cooling; for this purpose it is not necessary that the iron should ever exceed three per cent. nor the manganese two per cent., in an alloy of which the remaining constituents are nearly equal quantities of copper and lead. In the making of this alloy the usual precautions against the oxidizing of the copper should be taken, especially so if the copper used was not in a thoroughly deoxidized condition to start with. The deoxidizing of the copper can be done in the usual way by the use of a number of the different well known agents, such as: zinc in amount not to exceed eight per cent. of the final alloy, silicon not in excess of two per cent., potassium not in excess of one per cent., sodium not in excess of one per cent., phosphorus not in excess of one per cent., or magnesium not in excess of one per cent. Any one of these is added after the tempering alloy has been added and before the lead is added. It is desirable to first make up the tempering alloy, in melting the necessary constituents to produce an alloy of iron and manganese having practically sixty per cent. iron and forty per cent. manganese. This alloy is then allowed to cool, after which it is broken up in order to be in a condition convenient for weighing out in any desired amount to correspond with any given weight of copper. The copper is then melted in the usual way, the desired amount of tempering alloy is then added. The preferred amount of the tempering alloy

is two per cent. of the final composition. After this tempering alloy is melted the deoxidizing agent is then introduced in amount not exceeding those above mentioned, after which the lead is added, this is usually in amount equal to the total weight of the other constituents. The amount of lead, however, can be varied, a decrease in the amount of lead increases the hardness and strength of the alloy. The beneficial effects of the presence of lead are increased for both bearing and acid resisting qualities with an increase of the percentage of lead. But owing to the decrease of strength with an increase of lead, fifty per cent. lead is all that can be used for bronzes.

It is well known by those versed in the art that my alloy can be made up in part of scrap; that small quantities and traces of metals existing as impurities will not materially affect the beneficial results of my invention; that the manner of compounding these alloys may be varied without departing essentially from the spirit of this invention and still secure the beneficial effects of the same.

I am aware that prior to my invention attempts have been made for producing a suspension of lead in brass or bronze, but

What I do claim as my invention, and desire to secure by Letters Patent is:—

1. An alloy containing copper, lead and iron, the iron not exceeding three per cent. of the mixture and the copper and lead being of nearly equal quantities.

2. An alloy composed of copper, lead, iron and manganese.

3. An alloy composed of copper, lead, iron and manganese, the iron not exceeding three per cent. and the manganese two per cent. of the mixture.

4. An alloy containing copper, lead and a tempering agent composed of iron and manganese, the iron not exceeding three per cent. and the manganese two per cent. of the mixture, and the copper and lead being of nearly equal quantities.

5. An alloy containing copper, lead, iron, manganese, and zinc, the quantity of zinc not to exceed eight per cent. of the mixture.

6. An alloy containing copper, lead, iron, manganese and zinc, the iron not to exceed three per cent., the manganese not to exceed two per cent. and the zinc not to exceed eight per cent. of the mixture while the copper and lead are of about equal quantities.

7. The herein described method of producing an alloy containing copper, lead and iron, consisting in introducing the iron into the copper while the latter is in a molten state, and then adding the lead to the same.

8. The herein described method of producing an alloy containing copper, lead, iron and manganese, consisting in first melting together the iron and manganese to form a tempering agent, then introducing this agent into the copper while in a molten state, and then adding the lead.

9. The herein described method of producing an alloy containing copper, lead, iron, manganese and a deoxidizing agent, consisting in first producing a tempering agent by melting together the iron and manganese, then melting the copper, then adding the tempering agent to the molten copper, then adding the deoxidizing agent to the copper and tempering agent, and then adding the lead to the other constituents.

10. The herein described method of producing an alloy containing copper, lead, iron, manganese and zinc, consisting in first melting together a tempering agent composed of three parts of iron and two parts of manganese, then melting fifty or more parts of copper, then adding the tempering agent to the copper, then introducing eight parts of zinc, and then adding fifty or less parts of lead.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

LOUIS C. DODD.

Witnesses:
C. H. Bierbaum,
H. R. Bridgman.