UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN MANUFACTURE OF COPPER ALLOYS CONTAINING MANGANESE.

Specification forming part of Letters Patent No. **206,604**, dated July 30, 1878; application filed March 20, 1878; patented in England, February 7, 1876.

To all whom it may concern:

Be it known that I, PERCEVAL MOSES PARSONS, of Melbourne House, Blackheath, in the county of Kent, England, have invented a new and useful Improvement in the Manufacture of Metallic Alloys; and I do hereby declare that the following is a full, clear, and exact description of the same.

My improvement relates, generally, to that class of alloys in which copper forms the base and is alloyed with zinc and tin in various ascertained proportions, forming the different qualities of bronze, brass, yellow, and Muntz metal.

My invention relates more particularly to such of these alloys as contain a proportion of manganese; and my said invention consists in the method of incorporating the manganese by adding to such alloys a proper proportion of spiegeleisen, or ferro-manganese, or other form of carburet of iron combined with a sufficient quantity of manganese, whereby the proportion of manganese entering into such alloys may be more definitely controlled.

The alloys, composed as above, to which my invention is applicable are, as is well known, very numerous, and have been given a variety of names, according to the proportions in which the metals composing them are combined; but in order to explain the best means of putting my invention into practice, I will classify these alloys under three heads: first, those composed of copper and tin, which I will designate "gun-metal;" second, those composed of copper, tin, and zinc, which I will designate "bronze;" and third, those composed of copper and zinc, which I will designate "brass."

In carrying out my invention I find that to obtain the best effects it is desirable that the ferro-manganese to be used with the gun-metal alloys should be richer in manganese than that used with the brass alloys, while that used with the bronze alloys may be between the two, and regulated as conveniently as can be by the proportions of tin and zinc employed—that is to say, if little zinc is used in the bronze alloy the ferro-manganese employed may be as rich, or nearly as rich, in manganese as in the gun-metal alloys, while if the zinc predominates the ferro-manganese employed may be same as, or a trifle richer in manganese than, that used with the brass alloys; and if the zinc and the tin are about equal the quantity of the manganese contained in the ferro-manganese may be between that used for the gun-metal and that used for brass alloys.

The ferro-manganese used to mix with the gun-metal alloys should contain from about ten to forty per cent. of metallic manganese, while that used to mix with the brass alloys should contain from about five to twenty per cent. of metallic manganese, and that used for the bronze alloys should be between the two, according to the proportions of tin and zinc employed, as before explained.

In selecting the ferro-manganese to be used for the purpose of my invention it is very desirable that it should contain as little silicon as possible. When spiegeleisen can be obtained of the best quality, containing but a minute quantity of silicon and from five to ten per cent. of manganese, it will be suitable to mix with the brass alloys, and it may even be used with the gun-metal alloys; but it will be found advantageous to employ for both, as well as for the bronze alloys, a ferro-manganese, which I make as follows: I obtain ferro-manganese as now manufactured for and used in steel-works, rich in metallic manganese, containing, say, from fifty to sixty or even seventy per cent. This I melt in a crucible, under powdered charcoal, along with the requisite proportion of the purest wrought-iron scrap I can obtain, to bring down the quantity of metallic manganese to any of the proportions before named. I thus obtain a ferro-manganese suitable for the purposes of my invention, containing the least possible quantity of silicon. Thus, supposing it is desired to employ a ferro-manganese to mix with any of the before-named alloys containing twenty per cent. of manganese, and a ferro-manganese containing sixty per cent. of metallic manganese, and say one per cent. of silicon, is melted with wrought-iron scrap in the proportion of one hundred of ferro-manganese to two hundred of wrought-iron scrap, a ferro-manganese containing the desired quantity of

metallic manganese—*videlicet*, twenty per cent.—will be obtained, containing only one-third per cent. of silicon instead of one per cent., and so on for any other proportions required; not only this, but a still further portion of the silicon is eliminated and the metal refined by this second melting in a crucible, as described.

The quantity of ferro-manganese to be employed will vary both with the nature of the alloy as well as with the quality required in each particular alloy, and this will also, to a certain extent, have to be regulated by the quality of the copper, tin, and zinc employed. The purer these metals the larger may be the quantity of ferro-manganese employed, and therefore no precise quantities can be specified; but generally, for ordinary gun-metal—that is to say, gun-metal composed of about ninety per cent. of copper and ten per cent. of tin—from one-half to one and one-half per cent. of ferro-manganese, as above described, may be added, containing, say, about twenty per cent. of metallic manganese, and as the tin is increased the ferro-manganese should contain more manganese and less iron.

The quantity of ferro-manganese employed should be regulated according to the purposes for which the alloy is intended to be used. Generally the effect produced is, with the smaller quantities named, to increase the strength of the alloy and the hardness slightly; and as the quantity of ferro-manganese is increased the hardness is also increased, but at the same time the alloy becomes more brittle. A similar effect is produced by the addition of the ferro-manganese to the brass and bronze alloys. With the brass alloys from one-half to five per cent. of the ferro-manganese, as above described, may be employed with advantage for general purposes, and for the bronze alloys any proportions between those to be used for the gun-metal and brass alloys may be advantageously used, these proportions being adjusted according to the quantities of tin and zinc used—that is to say, the more tin used the less should be the quantity of ferro-manganese.

In putting my invention into practice the copper should be first melted in a crucible or other vessel in the ordinary manner, and the spiegeleisen or ferro-manganese, either with or without the addition of wrought-iron scrap, as before described, should at the same time be melted in a separate smaller furnace capable of generating a high temperature in a plumbago crucible under powdered charcoal, and when it is completely fused, and the copper is also fused and at a boiling-heat, the ferro-manganese should be poured into the copper and the two well mixed together by stirring with an iron rod previously made red-hot. The tin or zinc, or both, should then be added in the usual way and in the requisite proportions, according to the kind of alloy it is desired to produce. After the tin and zinc are added the metal should be again well stirred with a red-hot rod, and skimmed. It may then be either poured into ingot-molds for future use, or it can at once be cast in molds to produce any articles required.

In making castings I find that dry sand or loam molds, well coated with charcoal-blacking, are preferable to green-sand molds. The metal should be well skimmed before pouring, and it should be cast at as low a heat as possible, so long as it is sufficiently fluid to fill the mold, and the runner should have a good head and be attached to the thickest part of the casting, which, if possible, it should exceed in bulk, so as to solidify the last and act as a feeder while the cast is cooling. If metal molds are employed, the alloy is rendered closer in texture and somewhat harder.

In defining more clearly my invention, I would state that the oxide of manganese has heretofore been employed with copper alloys, the same being reduced from the oxide to the metallic state at the same time that it was mixed with the copper or its alloys. This operation, however, is most uncertain, as the actual amount of metallic manganese that may ultimately become mixed with the copper can never be determined with certainty. I therefore lay no claim to manganese compounds generally for the purpose, nor to alloys of the kind containing manganese, but only claim the improved method of incorporating the manganese in the form of ferro-manganese, which is a stable compound that can be remelted and mixed with other metals, still preserving the desired proportions with accuracy.

Having thus described my invention, what I claim as new is—

The method of manufacturing copper alloys containing manganese which consists in adding to copper alloys, while melted, a suitable proportion of melted spiegeleisen, ferro-manganese, or other carburet of iron containing a sufficient quantity of manganese, as and for the purpose set forth.

The above specification of my invention signed by me this 5th day of March, A. D. 1878.

P. M. PARSONS.

Witnesses:
P. R. PARSONS,
C. F. PARSONS.