

UNITED STATES PATENT OFFICE.

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PROCESS OF HARDENING COPPER.

SPECIFICATION forming part of Letters Patent No. 696,271, dated March 25, 1902.

Application filed August 12, 1901. Serial No. 71,800. (Specimens.)

To all whom it may concern:

Be it known that I, CARRIE RENSTROM, a citizen of the United States, residing at Seattle, in the county of King and State of Washington, have invented certain new and useful Improvements in Processes of Hardening Copper; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to a process for hardening copper or alloys of copper.

The invention consists in subjecting copper or the alloys of copper to heat of the proper temperature and for the proper length of time and while in a heated condition sprinkling sulfur upon the same and then subjecting the thus-treated copper or alloys of copper while in a heated condition to a blue-vitriol bath; and it consists, secondly, in subjecting copper or the alloys of copper to heat at the proper temperature and for the proper length of time and while in a heated condition sprinkling upon the same pulverized sulfur, then subjecting the thus-treated copper or alloys of copper while in a heated condition to a blue-vitriol bath, then reheating it for a suitable length of time—say about three minutes—and then permitting it to cool.

In treating copper or the alloys of copper by my hardening process I find it preferable to use alloys of copper. I have experimented successfully with different alloys, but find that an alloy of copper and tin give exceedingly fine results when treated by my process. Different alloys of copper will be employed, according to the use to which the alloy when manufactured into the desired product will be put. It is usual to cast or shape the copper or the alloy of copper into the particular product—as, for instance, a trolley-wheel, journal-bearing, propeller-wheel, or tool—before the same is hardened. The castings are heated over a fire, preferably of charcoal, for a suitable length of time—say about three minutes—and with a proper amount of heat. I have found that when the heat has reached a point at which tin will melt it gives the best results. The castings of copper or alloys of copper are preferably laid on the charcoal bed or fire. The castings, and incidentally the charcoal, are sprinkled with sulfur, preferably in a pulverized condition, so that the castings will be coated or

covered with the sulfur, and the fumes of the sulfur will also come in contact with the castings. The sulfur is preferably applied after the castings have been in the furnace until they have become thoroughly heated. After the sulfur has been applied the castings are permitted to remain in the furnace a short time. They are then removed from the furnace and while still hot are dipped in a solution of blue vitriol and allowed to remain for a short time. After the castings have been subjected to the blue-vitriol bath they are preferably reheated and then allowed to cool without the application of any cooling agent. I do not wish, however, to limit the invention to this reheating.

I have demonstrated by actual tests with the above process upon copper and the different alloys of copper and have found that the same have become hardened to a remarkable degree without destroying the ductility of the metal and that for commercial purposes the thus-hardened copper or alloys of copper are very useful where hardness and at the same time ductility and toughness are required.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The process of hardening copper or the alloys of copper which consists in subjecting the same to heat at the proper temperature and for the proper length of time, and while in a heated condition sprinkling sulfur on the same, and then subjecting the thus-treated copper or alloys of copper, while in a heated condition, to a blue-vitriol bath, substantially as described.

2. The process of hardening copper or alloys of copper which consists in subjecting the same to heat at the proper temperature and for the proper length of time, and while in a heated condition sprinkling upon the same pulverized sulfur, then subjecting the copper or alloys of copper while in a heated condition to a blue-vitriol bath, and then reheating it and then permitting it to cool, substantially as described.

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

CARRIE RENSTROM.

Witnesses:

FRANK J. MILLER,
CHAS. R. THOMPSON.