

UNITED STATES PATENT OFFICE.

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RENSTROM TEMPERED COPPER COMPANY, OF SEATTLE, WASHINGTON, A CORPORATION.

PROCESS OF HARDENING COPPER.

No. 822,299.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, CARRIE RENSTROM PLUMER, 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.

This invention relates to a process for hardening copper and the alloys of copper, and comprises subjecting the same to heat of a high degree that is sufficient to thoroughly melt the mass and while in a heated condition subjecting the same to the action of sulfate of copper (blue vitriol) for hardening the same and also to the action of a chilling ingredient.

The process also comprises subjecting copper or the alloys of copper to heat of a degree sufficiently high to melt the same and while in a heated condition subjecting the same to the action of sulfate of copper (blue vitriol) for hardening the same, and also to the action of bichromate of potash for chilling or freezing the metal.

The process further comprises subjecting copper or the alloys of copper to heat of a sufficiently high degree to melt the same and while in this condition subjecting the same to the action of sulfate of copper (blue vitriol) for hardening the same and also to the action of bichromate of potash for chilling or freezing the metal, then reheating the metal and allowing it to cool.

In carrying out my process copper or an alloy of copper is heated to a molten condition in a crucible, and while in this condition the same is subjected to the action of sulfate of copper (blue vitriol) in from, say, one to twenty ounces of sulfate of copper to one hundred pounds of copper or alloy of copper. The sulfate of copper is preferably in a pulverized condition. When sulfate of copper alone is used, the mass will be ready to pour into molds shortly after the addition of the said sulfate, as the sulfate is at once taken up by the mass. The sulfate of copper has the effect of hardening or toughening the copper or alloy of copper. To further harden or

toughen the metal, I treat the same, while in a molten condition, with a chilling agent or ingredient, such as bichromate of potash. This has the effect of freezing or chilling the copper or alloy of copper. The bichromate of potash is used in about the proportion of one to ten ounces to one hundred pounds of metal and is introduced into the molten mass preferably by placing it in a paper sack and dropping it into the said mass. The copper or the alloy of copper treated with the sulfate of copper and the bichromate of potash is thoroughly stirred until it becomes too stiff to permit of stirring, the introduction of the bichromate of potash having the effect of stiffening the mass. After the mass has become thoroughly chilled it is again reheated and then poured off into molds. The degree of heat employed is that which is sufficient to reduce the metal or metals to a molten mass, so that they will pour or run freely. When the mass has become liquefied, the chemicals are preferably placed in a paper sack in a pulverized dry condition and dropped into the molten mass. The mass is freely stirred before and after the addition of the chemicals. When the bichromate of potash is added, it is dropped in with the sulfate, and as it has a chilling effect upon the molten mass it will chill and freeze the metal and form it into a solid mass, unless a sufficient degree of heat is applied for a sufficient length of time to again reduce the mass to a freely-running liquid. The reheating is done to make the mass thin enough to flow freely and form a solid casting free from holes and having a smooth finish. When it is not desired to immediately use the composition in forming castings, the same would be permitted to form into a solid hard mass and would then have to be reheated and reduced to a molten condition when it was desired to form castings.

The metal produced when treated according to my process will be found to be tough and hard and serve as a most excellent anti-friction metal.

For tool purposes I find that an alloy composed of copper, tin, and black antimony gives most excellent results when the mass is treated with bichromate of potash for chilling or freezing the same.

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

1. The herein-described process of hardening copper, or the alloys of copper, comprising subjecting copper or the alloys of copper to heat of a sufficiently high degree to melt the same and while in a heated condition subjecting the same to the action of sulfate of copper for hardening the same, and also to the action of a chilling ingredient.

2. The herein-described process of hardening copper, or the alloys of copper, comprising subjecting the same to heat of a sufficiently high degree to melt the same, and while in a heated condition subjecting the same to the action of sulfate of copper for hardening the same, also to the action of bichromate of potash for chilling or freezing the metal.

3. The herein-described process of hardening copper or the alloys of copper, compris-

ing subjecting the same to heat of a sufficiently high degree to melt the same, and while in a heated condition subjecting the mass to the action of sulfate of copper for hardening the same and to the action of bichromate of potash for chilling or freezing the mass, and then reheating the mass and allowing it to cool.

4. The process of hardening copper, comprising the heating of copper until it is reduced to a molten condition and then introducing hardening ingredients and permitting them to chill the molten copper until it is too stiff to be stirred, the materials being stirred until such condition is reached.

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

CARRIE RENSTROM PLUMER.

Witnesses:

G. WARD KEMP,
L. C. MASSIE.