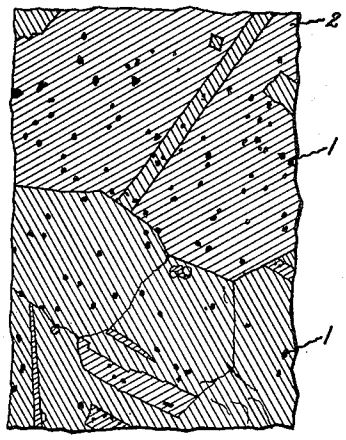
July 29, 1924. 1,502,857

S. B. LEITER

PROCESS OF TREATING COPPER AND THE PRODUCT THEREOF

Filed Feb. 2, 1923



Inventor:
Susan B. Leiter,
by Alexander & Lamb
Her Attorney.

Patented July 29, 1924. 1,502,857

UNITED STATES PATENT OFFICE.

SUSAN B. LEITER, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

PROCESS OF TREATING COPPER AND THE PRODUCT THEREOF.

Application filed February 2, 1923. Serial No. 616,513.

To all whom it may concern:

Be it known that I, SUSAN B. LEITER, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented a certain new and useful Process of Treating Copper and the Product Thereof, of which the following is a specification.

The present invention relates to the metallurgy of copper and comprises in particular a method of treating copper whereby a new product is secured which remains strong and ductile when heated in the presence of a reducing gas.

Heretofore when copper has been heated to a high temperature for any reason, for example, during annealing when hardened by wire drawing, great care had to be exercised to maintain a neutral medium about the heated metal. Contact with oxidizing gases caused oxidation and brittleness and contact with a reducing gas also caused brittleness and loss of mechanical strength. It is difficult to obtain under ordinary working conditions an environment for the copper during annealing which is neither reducing nor oxidizing.

Commercial copper commonly contains an appreciable quantity of copper oxide, some of which is distributed on the boundaries of the crystal grains either in solid solution or in a finely divided state. In fact, it is considered desirable to have present in the copper some copper oxide in order to improve the mechanical strength of the copper. When copper which contains oxide thus distributed, is heated in the presence of hydrogen or other reducing gas, the reduction of the oxide causes the crystals to become separated and as a result the metal becomes so brittle that it has little or no mechanical strength.

I have discovered that when copper is treated to cause a segregation of the oxide into globules that then the reduction of the oxide causes no appreciable change in the mechanical properties of the copper.

The accompanying drawing shows somewhat conventionally a photo-micrograph of copper treated in accordance with my invention.

The segregation of the oxide in the copper is carried out by heating the copper to a temperature within the range of about 875° to 925° C., but preferably at about 900° C. For example, when treating copper wire or sheet copper the work is packed within a tightly closed copper container to exclude access of air, and heated in a non-reducing atmosphere. The small amount of air left in the container with the work does no harm. An electric resistance furnace of the muffle type may be used as a heating means. After the copper has been heated to the desired temperature it is cooled slowly down to about 850° C., say, at a rate of about 25° C. drop per hour, and thereafter may be cooled at a more rapid rate as may be found convenient.

The drawing shows greatly enlarged, the oxide as globular masses, such as 1, scattered throughout the copper grains, designated by 2, the grain boundaries being largely free from oxide. When copper in which the contained oxide thus has been agglomerated is heated in hydrogen or under other reducing conditions, reduction of the oxide occurs but the grain boundaries are unaffected and therefore the strength and ductility of the metal are unimpaired.

What I claim as new and desire to secure by Letters Patent of the United States is:—

1. The process of rendering copper containing oxygen immune to the embrittling effect of reducing gas, which consists in segregating the oxide located between the boundaries of the grains of said copper into globules distributed throughout the mass thereof.

2. The process of rendering copper containing oxygen immune to the embrittling effect of reducing gas which consists in heating said copper to a temperature within the range of about 875° to 925° C. and thereupon cooling at such rate that the oxide is segregated into distinct globular masses distributed throughout the copper.

3. The process of rendering oxygenous copper immune to the embrittling effect of reducing gas which consists in heating said copper to about 875° to 925° C. and thereupon cooling at a rate of about 25° C. per

hour to cause the oxide to segregate into distinct globular masses distributed throughout the copper.

4. Metallic copper containing oxide segregated into globules distributed throughout the mass of said copper, leaving the boundaries of the grains of the copper substantially free from oxide, said copper remaining strong and ductile when heated in contact with reducing gas.

In witness whereof, I have hereunto set my hand this 31st day of January, 1923.

SUSAN B. LEITER.