UNITED STATES PATENT OFFICE.

JOHN N. LAUTH, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO HIMSELF AND GRAFF, BENNETT & CO., OF SAME PLACE.

IMPROVEMENT IN PROCESSES FOR ANNEALING AND HARDENING METALS.

Specification forming part of Letters Patent No. 132,675, dated October 29, 1872.

To all whom it may concern:

Be it known that I, JOHN N. LAUTH, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Annealing and Hardening Metals; and I do hereby declare the following to be a full, clear, and exact description thereof.

One of the chief difficulties experienced in the annealing of metals, particularly where, as in imitation Russia sheet-iron, a fine polish or finish is desired, arises from the presence in the annealing-box of more or less air, which, acting on the metal, results in oxidation. The same trouble exists in the hardening of metals, particularly dies for stamping coin or other hard substances where great perfectness of die-face is required. I have found that such oxidation may be wholly prevented in annealing by heating and cooling *in vacuo*, and in hardening by heating *in vacuo*.

To enable others skilled in the art to make and use my improvement I will proceed to describe its construction and mode of operation.

My improvement is applicable to any kinds or qualities of the metals that are ordinarily subjected to the annealing or hardening operations. In annealing I take such metallic articles as it is desired to anneal, and inclose them in any suitable air-tight annealing box or vessel that will withstand atmospheric pressure and the degree of heat which it is necessary to use. Such box or vessel may be made of iron or other metals or composition of metals, or of fire-clay, plumbago, or other suitable material. I then exhaust the air as perfectly as possible from such box or receptacle by the use of an air-pump, or by other suitable means of producing a vacuum. The box or other receptacle with its contents, by heat applied externally, is raised to the desired temperature, after which it is allowed to cool gradually, as in the ordinary process of annealing. The box can then be opened and the contents removed, fully annealed, and free from all trace of oxidation, except such, if any, as they may have had before being inclosed in the box. In the process of hardening the operation is the same, except that after the box and contents have been raised to the desired temperature the latter are suddenly discharged into the water or oil or other fluid by which the process is to be completed. However, I find it better in this operation to employ a long box, somewhat like a pipe with closed ends, and for most purposes a pipe will answer. The dies or other articles to be hardened are placed in one end, the box is hermetically closed, and the end containing the articles is inserted in the fire or furnace, the operator holding or manipulating it by the other end. When the box and contents have been raised to the required temperature, the outer or unheated end may be placed in close proximity to the water or oil or other fluid, the end of the box removed and the heated contents suffered to fall directly into the fluid so quickly that they will not be subject to the oxidizing influence of the air long enough to be injuriously affected.

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

As an improvement in the art of hardening and annealing metals, subjecting the same, when free from atmospheric influence, to the heating or heating and cooling operations, substantially as set forth.

In testimony whereof I, the said JOHN N. LAUTH, have hereunto set my hand.

JOHN N. LAUTH.

Witnesses:

A. S. NICHOLSON,

JAMES I. KAY.