UNITED STATES PATENT OFFICE.

RICHARD SAVARY, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO HIMSELF AND ROBERT C. TOTTEN, OF SAME PLACE.

IMPROVED PROCESS OF UNITING IRON AND STEEL WITH COPPER, BRASS, &c.

Specification forming part of Letters Patent No. **39,531**, dated August 11, 1863.

To all whom it may concern:

Be it known that I, RICHARD SAVARY, of the city of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Process for Uniting Iron or Steel with Copper or its Alloys; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention consists in uniting iron, in any of its various conditions of cast-iron, wrought-iron, or steel, with copper, brass, gun-metal, bronze, or any other of the various alloys having copper as their base, in such a manner as that these dissimilar metals—viz., iron and copper, or the alloys of copper—shall be so blended or incorporated at their surfaces of contact and union as that they shall, when united, form one solid piece and yet each preserve its peculiar and distinguishing characteristics.

This discovery, which will prove in various ways very useful in the arts, has been hitherto either entirely unknown or has failed of successful practical application.

My invention is distinguished from the uniting of two pieces of metal, on the one hand, and from bronzing metals with a thin film of copper, brass, or bronze on the other, as it consists in uniting wrought-iron, cast-iron, or steel with a solid piece of copper, brass, or bronze, &c., in a solid mass, so that they will be no more liable to separate by fracture or lamination at the point of contact of the two metals than at any other part of the mass thus formed.

To enable others skilled in the art to make use of my invention, I will proceed to describe the process by which I acccomplish the result which I have described. In doing this I will first explain the mode of uniting a solid piece of brass with cast-iron.

The piece of brass—as, for instance, a journal-box for shaft or other piece of machinery—is cast, swaged, or otherwise shaped into the requisite conformation, and is then placed in a flask or mold with the surface to be united to the iron left exposed. This surface is first cleaned with muriatic acid and is then smeared over with a paste composed of the following ingredients, viz: Borax is melted and then allowed to cool, after which it is pulverized. Of this calcined-borax powder I take thirty-five parts and add to it seven parts of sal-ammoniac, eight parts of arsenic, twenty-five parts of cast-iron filings, and twenty-five parts copper filings, making together one hundred parts. These ingredients, when mixed, are made into a paste of the consistence of thick molasses with a little water. The paste thus made is applied, as before stated, to the surface of the brass, and the melted iron is then poured into the mold, where it forms a close union with the surface of the brass by means of the paste, which serves as a flux. The melted iron ought not to be hotter than is requisite to make a good casting when it is poured into the mold.

If the piece of brass is of such size as not to become immediately or very rapidly heated by the melted iron, it is better to heat it before putting it into the mold, so that the melted iron may not be chilled on the surface which is to be united to the brass. If it is inconvenient thus to heat the brass before inserting it into the mold, the same result may be attained by having a gate or passage in the mold, in addition to that through which the melted metal is poured. This extra passage being left open for some time, the metal is allowed to run through the mold (in at one gate and out at the other) until the piece of brass is sufficiently heated, when the extra gate is closed and the casting is completed.

If it is desired to unite copper, brass, or any of the alloys of copper with wrought-iron or steel, the same process is pursued, excepting that the piece of wrought-iron or steel, previously heated and its surface cleaned with acid, is placed in the mold and the copper or brass is melted and cast onto it, the surface of the iron or steel to which the copper or brass, &c., is to be united being first smeared with the fluxing-paste before described.

When copper is to be united to iron the paste may be composed of calcined and powdered borax, sal-ammoniac, and brass filings, omitting the other ingredients; but when brass or other alloy of copper is to be united to the iron the paste, composed as first stated, should be employed.

Although not necessary so to do, I find it an advantage to add to the ingredients forming the fluxing-paste a little sulphuret of antimony when brass or any of the alloys of copper are to be united with iron.

Pulverized flint-glass or lime-glass may be used, if preferred, in place of the calcined borax, or a little glass may be added to the borax. Other substances may be used in place of those named to compose the fluxing-paste having the same chemical qualities; but those I have named will be found efficient for the purpose hereinbefore described.

My invention will be found to be of great practical utility in the mechanical arts. Parts of machinery which before were made of solid brass or copper may now be made of iron faced with brass or copper, thus saving a great expense in the construction of machinery—as, for instance, journal-boxes may be made of cast-iron faced in the journal-seat with brass. The interior of the cylinder of pumps and steam-engines may be made of iron faced or lined with brass, so that my improvement is susceptible of an almost endless variety of uses.

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

Uniting pieces of iron, whether cast, wrought, or steel, with copper, brass, bronze, or other alloys of copper, by casting one metal onto a solid piece of the other, having interposed between the surfaces to be thus united a flux composed of the ingredients hereinbefore described or their equivalents.

In testimony whereof I, the said RICHARD SAVARY, have hereunto set my hand.

RICHARD SAVARY.

Witnesses:

A. S. NICHOLSON,

W. BAKEWELL.