

UNITED STATES PATENT OFFICE.

WILLIAM GEORGE CLARK, OF GEELONG, VICTORIA, AUSTRALIA.

COPPERIZING IRON.

932,964.

Specification of Letters Patent.

Patented Aug. 31, 1909.

No Drawing.

Application filed August 18, 1908. Serial No. 449,088.

To all whom it may concern:

Be it known that I, WILLIAM GEORGE CLARK, a subject of the King of Great Britain, residing at Albert Coffee Palace, Geelong, in the State of Victoria, Commonwealth of Australia, metal worker, have invented a certain new and useful Improved Method of Copperizing Iron, of which the following is a specification.

This invention which is an improvement on the methods described in my prior United States patent, Number 885,668, granted April 21, 1908, and in my British patent, Number 10,763, of 1899, relates to the commercial treatment of iron in any form whether as plates, bars, tubes, wires, chains, castings, forgings or otherwise whereby it is coated with copper or an alloy thereof uniformly and of the desired thickness. The coating effected is free from pin holes or flaws of any description and the copper or alloy does not become brittle.

The main feature of the invention consists in the treatment on a commercial scale of heated iron with molten copper or alloy in the presence of a special flux consisting essentially of boracic acid, tartar and sal-ammoniac, although it is preferred to employ as additional ingredients silica, washing soda, borax, alum and niter. If the copper is practically pure, a small proportion of zinc, tin lead or aluminum should be added. When using sal-ammoniac or niter the best results are obtained by sprinkling same directly on to the hot surface to be treated.

Without restricting myself to definite proportions I would state the following as a thoroughly practical flux:—

Boracic acid	15 parts.
Tartar	13 parts.
Sal-ammoniac	4 parts.

When the other ingredients are added a suitable mixture is:—

Boracic acid	6 parts.
Tartar	6 parts.
Sal-ammoniac	3 parts.
Silica	8 parts.
Washing soda	4 parts.
Borax	6 parts.
Alum	1 part.
Niter	2 parts.

The heating of the iron and the maintenance of the copper in a molten state neces-

itates the employment of a suitable furnace but this forms no part of the present invention and many known forms of reverberatory furnace may be employed or modified according to circumstances, or to the preference of the operator. The only necessary condition is that there shall be sufficient heat to maintain the copper in a molten state.

For convenience I will first describe my invention as applied to the treatment of iron in the form of wire. The wire is preferably "pickled" in a mineral acid such as sulfuric or hydrochloric diluted in water in proportion of 1 of ordinary acid and 8 of water and then immersed in a saturated copperas solution *i. e.* a solution of commercial blue-stone in sulfuric acid (8 to 10 lbs. bluestone, 5 gallons water and $\frac{1}{2}$ gallon sulfuric acid). It is then dried and run into the furnace so that it gets heated before entering the bath of molten copper on the hearth of the furnace and on the top of said molten bath the flux before mentioned floats and assists in preventing oxidation. The wire passes through the flux and bath of molten copper under a bridge or guide extending across the bath and below the surface, and the wire then passes up again and out the other side of the receptacle containing the molten metal and out of the furnace to be wound on reels.

Similar treatment is observed with iron in the form of thin sheets, which are first raised to a cherry heat in the furnace before immersion in the molten bath, and are preferably agitated slightly in the bath.

Iron in the form of tubes or rods undergoes the same treatment except that they, like the thin plates just mentioned, do not pass under a bridge or guide in the bath.

If the iron has a genuine rust—oxid of iron—on it, it is not pickled but it is passed through or immersed in the solution of copperas.

If the iron has a clean shining surface—such a surface as wire has owing to the fact that it has been drawn, then the iron is pickled *i. e.* placed in a bath of sulfuric acid diluted with water in proportion of about 1 of acid to 8 of water.

Thick iron plates have their edges turned up slightly all around forming a sort of tray and are pickled and immersed in the manner previously mentioned. When dried they are heated to a cherry heat in the furnace. If the iron is not pickled, then, after immersion in the copperas solution it is dried, and then

sprinkled with sand or a mixture of sand and washing soda in the proportion of 16 to 1. As this melts, the special flux before mentioned is spread lightly over the surface, and the required quantity of copper either in a molten or solid state added and agitated. When this settles down evenly the scum is scraped off the surface, which is then covered with powdered charcoal to which is added a little borax and bone dust (about a cup or so of each of the latter to a bucket of charcoal). The plate is then drawn out of the furnace and allowed to cool. The amount of copper employed determines the thickness of the coating.

The expression "iron" throughout this specification is used in its widest sense and includes cast and wrought iron and steel of all descriptions.

The expression "copperizing" includes coating with a copper alloy or with a metal which will readily alloy with copper, such as silver or gold.

The proportions expressed are to be taken as illustrative and not arbitrary, and the

word "acid" refers to the ordinary commercial commodity.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. The method of copperizing iron, which consists in heating and immersing the iron in a bath of molten copper in the presence of a flux composed essentially of boracic acid, tartar, and sal-ammoniac.

2. The method of copperizing iron, which consists in heating and immersing the iron in a bath of molten copper in the presence of a flux composed of boracic acid, tartar, sal-ammoniac, silica, washing soda, borax, alum, and niter.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

WILLIAM GEORGE CLARK.

Witnesses:

DAVID FYFE GRIFFITHS,
ALFRED JAMES DAY.