United States Patent Office.

THOMAS WEATHERBURN DODDS, OF ROTHERHAM, ENGLAND.

Letters Patent No. 66,310, *dated July* 2, 1867; *patented in England December* 1, 1865.

IMPROVED METHOD OF EFFECTING THE CEMENTATION OF RAILS, AXLES, &c.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, THOMAS WEATHERBURN DODDS, have invented "Improvements in the Manufacture and Treatment of Railway Bars and Axles; also in the Construction of Furnaces, Machinery, and Apparatus connected therewith;" and I do hereby declare that the following is a full and exact description of the said invention.

My invention of improvements in the manufacture and treatment of railway bars and axles, and of other articles of iron, relates to a new and improved method of producing an iron rod, plate, or bar with a hardened or steeled surface without welding, and without blistering the steel, and consists in treating the surface of the bar or plate in a cementing furnace with a mixture of carbonaceous matter, potash or other alkaline matter, and carbonate or bicarbonate of lime (as marble chippings, gypsum, oyster shells, &c.,) or other matter containing lime, said invention having been made the subject of Letters Patent in the Kingdom of Great Britain, which bear date the first day of December, 1865, and the seventh day of March, 1853.

The novelty of my invention consists mainly in the use of a mixture of carbon, alkaline matter, and lime for steeling any desired iron surface by cementation thereof in a suitable furnace, the process of cementation being thereby effected at a lower temperature than in the ordinary methods, so that the iron is consequently converted into steel without blistering.

In carrying my invention into operation and effect, an ordinary cementing furnace may be used, but I prefer to make use of a furnace so constructed as that it may not only be charged but also discharged of any portion of its contents when the heat is up, without affecting the treatment of the remainder, or the general operation of the furnace, and without tearing down or injuring any portion thereof, and so provided with dampers and flue-valves for regulating the heat as to insure uniformity in the process of cementation and in the quality of steel produced.

The iron axle or other article to be hardened is placed in the cementing chamber of the furnace and covered with a mixture of any suitable carbonaceous matter, (charcoal by preference,) with potash or other alkaline matter, and carbonate or bicarbonate of lime, or matter containing lime, and heated to a bright red heat continuously for say five or six days, more or less, and is thereafter removed and rolled or hammered while yet hot and without re-heating. The proportions in which I prefer to use these ingredients are ninety-six parts of charcoal, one part and a half of alkaline matter, and two parts and a half of lime by measurement, but I do not confine myself to these proportions.

In steeling by this method the heads of railway bars, the head alone is exposed to the cementing process, the remainder of the bar being protected by burying the same in clay or other material. To perfect and finish railway bars or axles which have by this process been steeled on their surface to the required depth, they are withdrawn from the furnace without letting down the heat to any great degree, and are introduced without re-heating between heavy rolls, by which the wearing surfaces are condensed and hardened as required. Instead of using rolls the wearing surfaces may, if preferred, be condensed by hammering with any convenient arrangement of hammers.

Having thus described my invention, and especially its application to the production of hardened axles and steel-headed railway bars, I claim therein as new, and desire to secure by Letters Patent—

The conversion of an iron surface into steel by treating the same in a suitable cementing furnace with a mixture composed of charcoal or other carbonaceous matter, potash or other alkaline matter, and lime, or matter containing lime, substantially as herein set forth.

In witness whereof I, the said THOMAS WEATHERBURN DODDS, have hereunto set my hand and seal, the tenth day of May, in the year of our Lord one thousand eight hundred and sixty-six.

T. W. DODDS. [L. S.]

Witnesses:

FRANCIS HOOLE, *Notary Public,*

WM. UNWIN, *Solicitor, Sheffield.*