

UNITED STATES PATENT OFFICE.

ERASTUS E. PIERCE, OF NEW BRIGHTON, PENNSYLVANIA, ASSIGNOR TO
STANDARD HORSE NAIL COMPANY, OF NEW BRIGHTON, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

MANUFACTURE OF ARTICLES OF IRON OR STEEL.

No. 827,882.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, ERASTUS E. PIERCE, a citizen of the United States, residing at New Brighton, in the county of Beaver and State of Pennsylvania, have invented certain new and useful Improvements in the Manufacture of Articles of Iron and Steel, of which the following is a specification.

In the ordinary processes of making small articles, such as horseshoe-nails, of iron or steel the blanks are forged and then cold-rolled, or they are forged and rolled and drawn hot; but in either case the hot blanks or nails are deposited in a metallic receptacle and allowed to cool. This results in annealing the blanks or nails and also in the formation of a coating or scale of oxid, which must be subsequently removed by tumbling, which requires much time and results in a very material loss of strength in the nails.

I have found by many practical operations that if the metal instead of being allowed to cool slowly, as heretofore, is suddenly cooled while at the forging heat—that is, a heat above a low red heat—the formation of oxid is to a great extent prevented, and by then cold-forging the articles are very much stronger than when produced as usual, many practical tests showing an increase of tensile strength of over thirty-four per cent. as a result of these operations. The articles are also more elastic and take a brighter finish. Steel or iron is employed, but with such a low percentage of carbon—that is, .40 or under—as will prevent hardening when rapidly cooled. If soft steel, such as Siemens-Martin or open-hearth, is used, care should be taken that it is so low in carbon that the sudden cooling will not temper and harden the articles, the object of thus suddenly cooling not being to harden or anneal the product, but to prevent the annealing and the formation of the thick scale which always results from slow cooling.

Different means may be employed for suddenly cooling the nails—as, for instance, by directing a spray of water by an air-current upon the articles as they fall from the machine or while in the pot or receptacle. Such cooling results in reducing the temperature

to not over 212°, above which water could not be employed, and generally to a temperature sufficient to handle by hand. The exact degree to which the articles are cooled will depend upon the temperature of the water or other liquid employed, it only being essential to secure a rapid cooling from the forging heat to a comparatively cold condition.

I am aware of the practice of treating metal by first heating and then while at a low red heat immersing it suddenly in water. This results in annealing and in reducing the tensile strength of the metal and also in reducing its elasticity.

I am also aware of the fact that certain metals high in carbon have been subjected to a sudden cooling; but the result in such case is to harden or temper the same, and this latter treatment is therefore practicable for use so far as any effective result is secured in the treatment of what are known as “tool-steels” or “cast-steels,” which has for its object to render them suitable for dies or to give hard cutting edges.

The object of my invention is not to harden the articles in the sense of tempering them nor to anneal them, and thus impair their elasticity and tensile strength, but to increase their tensile strength and render them more elastic, while also imparting to them a great degree of ductility, and I have discovered that the sudden cooling of the metal while it is above a low red heat results in securing these characteristics in the article and that if the article thus produced is then further treated by cold-forging a greater degree of density and stiffness is secured.

Without limiting myself to the use of any special means of cooling, I claim—

1. The within-described improvement in the manufacture of articles of wrought iron or steel of a grade below a tempering grade, consisting in subjecting the metal while above a low red heat to a treatment whereby it is suddenly cooled to a temperature of approximately less than 212°, and finishing without reheating, substantially as set forth.

2. The within-described improvement in the manufacture of articles of wrought iron

or steel of a grade lower than a tempering
grade, consisting in subjecting the metal
while above a low red heat to means for sud-
denly cooling the same to a temperature of
5 approximately less than 212° and then fin-
ishing by cold-forging, substantially as set
forth.

In testimony whereof I have signed my
name to this specification in the presence of
two subscribing witnesses.

ERASTUS E. PIERCE.

Witnesses:

FRANK REED,
JOHN READ MINER.