

UNITED STATES PATENT OFFICE.

CHARLES MOTIER NES, OF YORK, PENNSYLVANIA.

IMPROVEMENT IN THE MANUFACTURE OF STEEL IN CRUCIBLES.

Specification forming part of Letters Patent No. 121,889, dated December 12, 1871.

To all whom it may concern:

Be it known that I, CHARLES MOTIER NES, of York, in the county of York and State of Pennsylvania, have invented certain new and useful Improvements in the Manufacture of Steel, of which the following is a specification:

My present invention is directed to the production of an improved steel from either cast or wrought-iron. The invention is based upon the employment of an ore known as "Codus ore," whose properties and the localities where it may be found are fully set forth in Letters Patent heretofore granted me for improvements in the manufacture of iron and steel, which ore, by being mingled with the iron in a crucible, will, if proper treatment be observed, convert the cast or wrought metal into an improved steel.

The manner in which I carry my invention into effect is as follows: I employ a crucible of ordinary construction, made of plumbago and other ingredients, like those used for making ordinary cast-steel. When the crucible is to be used for making steel from cast-iron I tap a hole in it, in which I insert a pipe or tube made of some refractory material; the tube connects with a blast or air-forcing apparatus, which, at the proper time, is used to blow air into the charge in the crucible until the pig or cast-iron is decarbonized.

To make steel from cast-iron or pig, I put in the crucible one hundred pounds of pig and from one-quarter of a pound to five pounds of the Codorus or "silicon steel" ore above mentioned with or without charcoal, as desired. I then place the crucible in a furnace of the ordinary kind for making cast-steel, heat until the metal and ore are melted and thoroughly boiled together, and then turn on the blast and blow air into the charge until the metal is decarbonized. The blast is continued for from five to twenty minutes, depending upon the nature of the metal and how far the decarbonization is to be carried; and the whole time, during which the metal remains in the furnace, is usually not more than from two to three hours. While blowing air into the crucible its cover is partially removed to permit the escape of air, or a small hole may be formed in the lid for this purpose. When decarbonization is effected and the charge has remained a sufficient time in the furnace, I take out

the crucible and pour out the melted steel, which is then treated in the way ordinary crucible steel is. In this way an improved crucible silicon steel is produced. The silicon from the ore is not so readily destroyed by heat as carbon, consequently the pig-iron or cast-iron, when melted and subjected to blast, as above described, is decarbonized, the silicon penetrates the iron, and crucible silicon steel is made.

In making steel from wrought-iron, such as old horseshoes, scrap, &c., I do not connect the blast with the crucible, and consequently no air is blown therein. I cut up the old iron, horseshoes or any other suitable wrought-iron with ordinary shears, such as used for cutting up iron in the ordinary manufacture of the same into cast-steel. I then fill the crucible with the scrap or pieces of wrought-iron and with Codorus ore in the proportion of one hundred pounds of wrought metal to from one-quarter of a pound to five pounds of Codorus ore. These proportions, as well as those given for making steel from cast-iron, may be varied, but I find the best results attained within the limits specified. Charcoal, in quantity from one to ten ounces, may be added or not to the charge, as preferred. I then place the crucible, covered in the usual way, in an ordinary furnace for making cast-steel and melt and thoroughly boil together the iron and ore, which operation will take, say, three or four hours. I then take out the crucible and pour the melted steel into molds of any desired shape. The charcoal is added in case I desire to have a hard steel, the carbon in the charcoal making it harder, while the silicon in the ore gives it at the same time toughness and tenacity. I find that old horseshoes may be readily and quickly reworked in the manner above described, and the process may be very economically conducted with them, although of course it is applicable to all wrought-iron. By this process I am enabled to make a steel which is unlike ordinary cast-steel from the fact that it will weld onto itself, which ordinary cast-steel will not do; is softer, more malleable, and tougher, and will bear a higher heat. The purifying effects of the ore on the horseshoes, iron, &c., causes the steel to be entirely free from the deleterious properties which ordinarily produce non-uniformity and bad steel.

Having described my invention and the man-

ner in which the same is or may be carried into effect, what I claim and desire to secure by Letters Patent, is—

1. The manufacture of steel from pig or cast iron and Cadorus ore in a crucible, substantially in the manner herein described.

2. The manufacture of steel from old horeshoes or other wrought-iron and Cadorus ore in a crucible, substantially as herein set forth.

In testimony whereof I have signed my name to this specification before two subscribing witnesses.

CHARLES MOTIER NES.

Witnesses:

JOHN A. WILSON,
JOHN W. STEWART.

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