

UNITED STATES PATENT OFFICE.

FRED. J. SLADE, OF TRENTON, NEW JERSEY.

IMPROVEMENT IN THE MANUFACTURE OF STEEL.

Specification forming part of Letters Patent No. **113,587**, dated April 11, 1871.

I, FRED. J. SLADE, of Trenton, in the county of Mercer and State of New Jersey, have invented certain Improvements in the Manufacture of Steel, of which the following is a specification:

Under date of the 17th of May, 1870, Letters Patent were granted to me for "the manufacture of steel by the decarbonization and subsequent recarbonization of a bath of molten steel or wrought-iron on the hearth of the reverberatory furnace."

Instead of charging scrap-iron or steel into the furnace, the same result may be obtained by using deoxidized ore, commonly known as "sponge," which is simply a form of wrought-iron or steel; or the bath may be produced directly in the furnace by charging a mixture of ore and carbon, the elements of which shall first react upon each other to form cast-iron, steel, or wrought-iron, which is then to be treated as described in my patent above alluded to.

To avoid evasion of my previous patent, I therefore now desire to secure by Letters Patent the manufacture of steel from a bath of molten wrought-iron, or steel produced from deoxidized ore or sponge, or from a mixture of ore and carbonaceous matter, in the manner herein described. When proceeding in this manner I first form a mixture of ore with charcoal, anthracite, or other carbonaceous matter in such proportions that the carbon shall, when heated, remove the oxygen from the ore, or even be in excess of the quantity necessary for this purpose. In the one case a product of wrought-iron and in the other of steel will result. This mixture is then subjected to a

heat, either in the melting-furnace or in a separate chamber, sufficient to effect the deoxidation of the ore.

The resulting wrought-iron or steel is then melted in the melting-furnace, and if it be not already sufficiently decarbonized, the excess of carbon is removed by the addition of scrap, puddle-balls or bars, sponge, ore, or other similar material, or by simply allowing it to remain in a molten condition under the influence of the flame until a bath nearly approaching wrought-iron and of uniform and known composition is obtained.

A suitable recarbonizing material—such as spiegeleisen or Frankinite iron—is then added in sufficient quantity to give the desired grade of steel, and to remove the red-shortness of the decarbonized metal, and thus give a workable steel.

I make no claim to the manufacture of wrought-iron sponge by heating ore in contact with carbon, nor to the manufacture of steel by melting a mixture of ore and carbon of suitable proportions to produce steel directly; but

What I do claim is—

The manufacture of steel by the recarbonization of a bath of metal produced from iron sponge, or from a mixture of ore and carbonaceous matter previously melted and decarbonized, substantially as described.

FRED. J. SLADE.

Witnesses:

J. D. HALL,
W. C. TAYLOR.