

# UNITED STATES PATENT OFFICE.

JAMES C. STOCK AND JAMES E. EMERSON, OF TRENTON, NEW JERSEY.

## IMPROVED PROCESS FOR MAKING STEEL.

Specification forming part of Letters Patent No. 34,095, dated January 7, 1862.

*To all whom it may concern:*

Be it known that we, JAMES C. STOCK and JAMES E. EMERSON, both of Trenton, in the county of Mercer and State of New Jersey, have invented a new and useful Improvement in the Manufacture of Steel; and we do hereby declare that the following is a full, clear, and exact description of the same.

Our invention consists in a certain process for manufacturing tools, cutlery, and other articles of steel by first casting the articles in iron with a suitable quantity of oxide of manganese, then converting the cast-iron into what is known as "malleable iron" by decarbonization, (without remelting,) and afterward recarbonizing it to a suitable degree by heating in an air-tight pot, box, or oven with vegetable charcoal, the entire operation being performed in the manner hereinafter more fully explained and so as to retain throughout the shape in which the articles are originally cast in iron.

In carrying out our invention we apply to iron, either in the ladle or previously, a suitable quantity of the oxide of manganese to act as a flux and cast the iron into proper form for axes, chisels, or whatever it may be desired to produce, and next convert it into malleable iron by means of the process and apparatus ordinarily used for the purpose—that is to say, we heat the articles in a suitable oven or furnace, in which they are embedded in and covered with the iron scales obtained from rolling-mills or forges, or oxide of iron in any other convenient form, generally continuing the process for such time as shall be sufficient to effect thorough decarbonization, which will vary according to the size or thickness of the articles, but is generally about ten days.

In converting the malleable cast-iron into steel we use a furnace similar to what has been used for the manufacture of steel by cementation, or of any other suitable kind. The articles are packed in charcoal in pots or boxes of the usual or any suitable form and kind, or in ovens, and these are closed up air-tight and exposed in the furnace to a heat below the fusing-point, and varying according to the

temper of steel required, for from two to ten days, according to the size and thickness.

We are aware that tools have previously been produced by forging them into shape in the form of wrought-iron and afterward case-hardening or converting their surfaces into steel by partial carbonization, and also that it has been proposed to cast articles of steel or of iron and steel mixed and anneal the same by partial decarbonization, afterward tempering in the usual manner.

We do not desire to be understood as claiming either of the above processes as our invention, neither do we claim to have invented any new mode of manufacturing steel from wrought or malleable iron; but, having practically and thoroughly tested our invention, we have discovered that a superior article of steel is produced by decarbonizing the cast-iron, so as to change its structure to that of malleable or wrought iron, and afterward recarbonizing to a sufficient extent to convert it into steel.

We are also aware that the oxide of manganese is commonly used as a flux in iron-manufacture; but in our invention it is of especial importance to give strength and toughness to the steel by causing the particles to adhere more perfectly.

What we claim as our invention, and desire to secure by Letters Patent, is—

The manufacture of tools, cutlery, or other articles by first casting the articles in the proper forms of iron, with which a suitable quantity of the oxide of manganese has been combined, then converting them into malleable iron by decarbonization, but without changing their shape, and afterward converting them into steel by recarbonizing them to the requisite extent by heating in an air-tight pot or other receptacle with vegetable charcoal, all as hereinbefore explained.

JAMES C. STOCK.  
JAMES E. EMERSON.

Witnesses:  
W. B. HILL,  
FRANK JACOBY.