

# UNITED STATES PATENT OFFICE.

MARTIN F. COOMES AND ARUNAH W. HYDE, OF LOUISVILLE, KENTUCKY.

PROCESS OF CARBURIZING MALLEABLE CAST-IRON OR LOW-CARBON STEEL.

SPECIFICATION forming part of Letters Patent No. 422,119, dated February 25, 1890.

Application filed May 29, 1889. Serial No. 312,566. (Specimens.)

*To all whom it may concern:*

Be it known that we, MARTIN F. COOMES and ARUNAH W. HYDE, citizens of the United States, residing at Louisville, in the county of Jefferson and State of Kentucky, have invented certain new and useful Improvements in the Process of Carburizing Malleable Cast-Iron or Low-Carbon Steel; and we do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to the manufacture of steel; and its object is to effect a cheap and rapid carburization of malleable cast-iron or of low-carbon steel by the use of certain carbon compounds which are readily decomposed by contact with the heated metal to be carburized, whereby the carbon is set free and unites with the metal, thus converting the malleable cast-iron into steel or the low-carbon steel into high-carbon steel.

To carry our invention into effect we employ a bath composed of milk in any quantity, in which is placed the metal raised to a white heat, where it is allowed to remain while cooling. The heat from the metal decomposes the sugar and other carbonaceous compounds contained in the milk, and the carbon thus set free is absorbed by and chemically unites with the metal.

In our process any kind of milk, or its equiv-

alent condensed milk, may be used, and in any desired quantity to supply the requisite carbon, a deficiency or surplus of carbon affecting the extent and economy but not the completeness of the carburization. A quantity insufficient to carburize the whole mass will case-harden it, if case-hardening is desired; or the metal may be reheated and the process repeated.

In preparing the bath the milk may be mixed with water, and the following bath we find by experiment gives excellent results—namely, milk or condensed milk, one pound; water, one gallon.

If desired, the bath may be heated to any extent short of decomposing it before placing the heated metal in it.

Having fully described our invention, what we claim, and desire to secure by Letters Patent, is—

In the manufacture of steel, the process of carburizing malleable cast-iron or low-carbon steel, which consists in immersing the metal raised to a white heat in milk, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

MARTIN F. COOMES.  
ARUNAH W. HYDE.

Witnesses:

W. E. BUCKEL,  
W. C. PETTY.