

UNITED STATES PATENT OFFICE.

FRANCIS G. BATES, OF PHILADELPHIA, PENNSYLVANIA.

COMPOUND FOR CONVERTING IRON INTO STEEL BY CEMENTATION.

SPECIFICATION forming part of Letters Patent No. 428,445, dated May 20, 1890.

Application filed November 4, 1889. Serial No. 329,219. (No specimens.)

To all whom it may concern:

Be it known that I, FRANCIS G. BATES, a citizen of the United States, and a resident of Philadelphia, Pennsylvania, have invented 5 certain Improvements in Compounds for Converting Iron into Steel by Cementation, of which the following is a specification.

The object of my invention is to provide for the converting of wrought, malleable, or 10 cast iron or low steel into high-grade steel by a cementation process, my present invention being a modification of that set forth in my application filed October 29, 1887, Serial No. 253,777, and consisting in the peculiar compound used for packing in the converting box 15 or flask the articles to be converted.

The compound consists of from eighty to one hundred parts of carbon—such as pulverized charcoal, still-coke, or the like—and 20 from five to ten parts of cryolite, to which may sometimes be added from ten to twenty parts of slaked lime and from five to ten parts of rosin or carbonate of soda.

In treating Bessemer steel the compound 25 may consist simply of the carbon and cryolite, the lime being preferably added when wrought-iron is being treated, and the rosin or soda, as well as the lime, being added when treating articles of malleable or cast iron.

The process is carried out in substantially 30 the manner set forth in my former application—that is to say, the articles or pieces of metal to be converted are packed with the compound in the converting box or flask, so 35 that each piece or article will be surrounded by said compound, the flask when full being closed so as to be air-tight, and then subjected to heat in a suitable oven, the temperature being gradually raised until the flask reaches 40 a white heat, at which temperature it is maintained for a period which will vary depending upon the bulk of the articles being treated or upon the desired extent of the conversion, a simple case-hardening or conversion being 45 effected in less time than if the articles are to be converted throughout. When the articles are removed from the flask, they are, by

preference permitted to cool rapidly, so as to hasten contraction.

Castings of gray or malleable iron, steel 50 castings, or articles of wrought-iron or Bessemer steel may by my improved process be changed in character, so as to acquire a fine grain and homogeneous structure, and so as to be capable of receiving any desired degree 55 of temper, which renders them available for use in the manufacture of cutting-tools of all kinds.

The cryolite which I use as one of the ingredients of my compound is a double fluoride 60 of aluminum and sodium, and is preferred in all cases, although other fluorine compounds may sometimes be used, and other hydrated minerals may take the place of slaked lime, the main purpose of which is to furnish a 65 supply of hydrogen, which materially facilitates the converting process.

Having thus described my invention, I claim and desire to secure by Letters Patent—

1. The within-described compound for converting iron or low steel into steel of high 70 quality by the cementation process, said compound consisting of eighty to one hundred parts of carbon and five to ten parts of cryolite, substantially as specified.

2. The within-described compound for converting iron or low steel into steel of high 75 quality by the cementation process, said compound consisting of powdered carbon, cryolite, and lime, substantially as specified.

3. The herein-described compound for converting iron or low steel into steel of high 80 quality by the cementation process, said compound consisting of powdered carbon, cryolite, lime, and rosin or soda, substantially as 85 specified.

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

FRANCIS G. BATES.

Witnesses:

R. SCHLEICHER,
HARRY SMITH.