UNITED STATES PATENT OFFICE.

SAMUEL HUFTY, OF CAMDEN, NEW JERSEY, AND JOSEPH K. CALDWELL, OF PHILADELPHIA, PENNSYLVANIA.

PROCESS OF CONVERTING CAST-IRON INTO STEEL.

SPECIFICATION forming part of Letters Patent No. 536,083, dated March 19, 1895.

Application filed June 12, 1893. Renewed November 8, 1894. Serial No. 528,261. (No specimens.)

To all whom it may concern:

Be it known that we, SAMUEL HUFTY, of Camden, New Jersey, and JOSEPH K. CALDWELL, of Philadelphia, Pennsylvania, both citizens of the United States, have invented certain Improvements in Converting Cast-Iron into Steel, of which the following is a specification.

The object of our invention is to remove a certain portion of the carbon from cast iron or iron containing carbon in such proportion that it is hard and brittle, whereby we are enabled to convert such iron into steel of such ductility that it can be shaped, hammered, drawn, or rolled in the same manner as steel produced in the ordinary way or can be tempered in order to form cutting tools or for other purposes for which tempering is usually resorted to.

The main feature of our invention consists in subjecting the cast iron while highly heated, but still considerably below the point of fusion, to the action of the gases resulting from the decomposition by heat of nitro-muriatic acid. This acid (the aqua-regia of commerce) is a very powerful oxidizing agent, differing in its action from either nitric acid or muriatic acid, and we have found that the gases resulting from its decomposition under heat, have the effect of attacking and removing carbon in the form in which the same is found in cast iron, and of doing so in a much shorter time than any of the other decarbonizing agents which have been proposed for the purpose and with which we are familiar.

The cast iron which is to be treated may be in the form of bars, blocks or molded articles and should be confined in a crucible or retort, or placed upon the hearth of a furnace where it can be heated to the proper degree.

The nitro-muriatic acid can be decomposed directly in the furnace or crucible containing the metal, or the gases resulting from the decomposition of the acid can be introduced into such furnace or crucible, if the decomposition is effected in a separate vessel.

In carrying out our invention the quantity of acid to be used and the time during which the treatment is continued will, of course, vary, depending upon the bulk of the iron under treatment and the extent of conversion required, increased bulk of material requiring an increased quantity of acid and the extent of conversion being greater or less, depending upon the length of time during which the iron is subjected to the action of the gases. As an instance, however, of what may be done in the practical carrying out of our invention we may say that in the treatment of ordinary white iron the use of thirty ounces of the acid to every one hundred pounds of the iron will give good results.

We are aware that it is old to treat molten iron with a mixture of hydrochloric and muriatic acids, but such treatment could not accomplish the result obtained by us since a failure to secure the proper grade or softness of steel in castings made from the mass of molten iron can not be remedied; whereas, by treating the cast iron in solid forms with nitro-muriatic acid, we are enabled to re-treat the same castings at any time when the proper or desired softness is not obtained in the first treatment; and furthermore, our castings are not subjected to the action of subsequent fusion.

Having thus described our invention, we claim and desire to secure by Letters Patent—

The herein described process of decarbonizing cast iron, consisting in subjecting the solid metal to the action of high heat and the gases resulting from the decomposition of nitro-muriatic acid, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

SAMUEL HUFTY.
JOSEPH K. CALDWELL.

Witnesses:
FRANK E. BECHTOLD,
JOSEPH H. KLEIN.