

# UNITED STATES PATENT OFFICE.

OGDEN BOLTON, JR., OF CHARTIERS TOWNSHIP, AND JOHN PEDDER, OF  
PITTSBURG, PENNSYLVANIA.

## IMPROVEMENT IN THE MANUFACTURE OF STEEL FOR BOILER-PLATES, &c.

Specification forming part of Letters Patent No. 140,673, dated July 8, 1873; application filed  
April 12, 1873.

*To all whom it may concern:*

Be it known that we, OGDEN BOLTON, Jr., of Chartierstownship, and JOHN PEDDER, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in the Manufacture of Boiler-Plate Steel; and we do hereby declare the following to be a full, clear, and exact description thereof.

Our invention consists in the manufacture of homogeneous boiler-plate steel, of a uniformly low quality, by subjecting a hard or high steel plate or ingot to the process of decarbonization, by the use of suitable known decarbonizing agents, at less than a melting temperature.

To enable others skilled in the art to make use of our improvement, we will proceed to describe its manner of operation and use.

In the manufacture of homogeneous boiler-plate steel it has been found that however carefully the work is carried on all the plates will not be of uniform quality, and hence the harder plates have to be thrown out, with a consequent loss; or, if, as is commonly the case, they are worked in the danger of disaster from explosion or excessive pressure is thereby materially increased. By our process any such plates, which are found to be too hard, are readily decarbonized till they are brought to the desired standard, and then they are worked in without loss or danger. Also, it is well known that in making such boiler-plates of steel on a large scale the pouring of soft steel, such as is required, is attended with considerable risk of waste and loss. If the steel be made a little harder such risk is largely obviated, but the steel is then too hard for boiler-plate. By our process we make the boiler-plate hard, and then decarbonize it to such degree that it shall be equal to the best boiler-plate made, and of the same uniform quality; and such decarbonizing process we perform on the ingots themselves, or on the worked steel at any desired subsequent stage in its manufacture. The steel to be decarbonized is inclosed in a suitable box, case, retort, or furnace, and is covered on all sides, either in separate blocks

or sheets, or in alternate layers, with any known suitable oxidizing agents or substances capable of evolving, when heated, oxygen, chlorine, or fluorine, or other gases which will combine with the carbon of the steel; or such gases may be generated in a separate retort and conveyed directly to, and brought into close contact with, the steel to be decarbonized. While subjected to this process the steel is to be heated to any desired temperature, but preferably to about a cherry-red heat. The process is carried on in about the manner adopted in the cementation process, and for about the same length of time, varying with the thickness of the plate, the amount of the reduction desired, the temperature employed, &c., the effect of which conditions, as effecting the result, are within the knowledge of the skilled workman, and need not be stated in detail. The utility of the process is also obvious. The plates, when brought to a uniformly low quality, are removed and worked up in the usual way.

The conditions under which the operation above described can be successfully carried on will vary considerably, as in other kindred operations, but for the general purposes we believe the following to be best: We employ steel containing from .3 to .4 (three-tenths to four-tenths) per cent. of carbon, as this is the easiest to run for our purpose, and bring the same to ingot or plate form to a thickness of about one inch. Such plates, when embedded in or surrounded by metallic or other suitable oxide, in any suitable known heating-furnace—such, for example, as is used in the cementation process—is kept at about a cherry-red heat for from one and a half to two days, by which they will be brought to the condition desired. With every increase of, say, .1 (one-tenth) per cent. of carbon in the steel the decarbonizing operation should be continued about or a little more than half a day longer.

The plates produced by the process above set forth will come under the head of homogeneous boiler-plate steel, though the process may be arrested before the same degree of decarbonization is carried to the center as exists at the surface. For practical purposes

it will be homogeneous, and such plates are so recognized in the art.

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

The manufacture of homogeneous boiler-plate steel by bringing a hard or high steel to a uniformly low grade, through the agency of decarbonizing agents brought to bear on the same after pouring, and while in an unmelted state, substantially in the manner set forth.

In testimony whereof we, the said OGDEN BOLTON, Jr., of Chartiers township, and JOHN PEDDER, have hereunto set our hands.

OGDEN BOLTON, JR.  
JOHN PEDDER.

Witnesses:

A. S. NICHOLSON,  
G. H. CHRISTY.