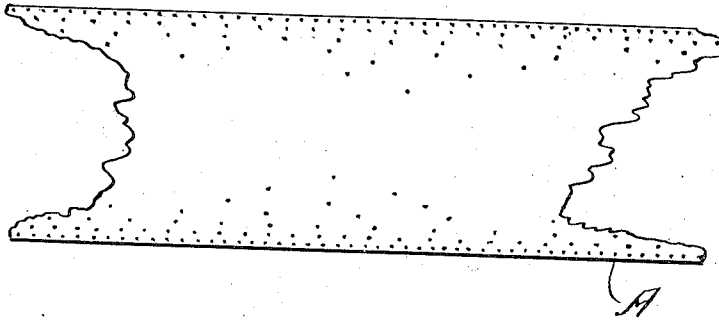


A. J. ROSSI.
PROCESS OF TREATING METALLIC BODIES.
APPLICATION FILED APR. 8, 1908.

986,504.

Patented Mar. 14, 1911.



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UNITED STATES PATENT OFFICE.

AUGUSTE J. ROSSI, OF NEW YORK, N. Y., ASSIGNOR TO THE TITANIUM ALLOY MANUFACTURING COMPANY, OF NEW YORK, N. Y.. A CORPORATION OF MAINE.

PROCESS OF TREATING METALLIC BODIES.

986,504.

Specification of Letters Patent.

Patented Mar. 14, 1911.

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To all whom it may concern:

Be it known that I, AUGUSTE J. ROSSI, a citizen of the United States, and a resident of the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Processes for Treating Metallic Bodies, of which the following is a specification.

The object of my present invention is to incorporate into a given metallic body, or into portions thereof as required, a desired addition of titanium, and to accomplish this without fusion or mechanical treatment. I attain this object by my novel process as follows, viz: I pack the metallic body, or those portions thereof to be permeated by titanium, in a powder composed of, or containing in powdered state an alloy of titanium with, preferably, the same metal as that constituting or preponderating in said body. I then subject the mass to a high temperature approximating, but, in all cases, lower than the fusing point of said metals, or either of them, and maintain said temperature until the desired amount of incorporation and permeation has been effected. On cooling and withdrawing the metallic body treated, it will be found to have absorbed and to contain, in permeations from its surface, inwardly more or less of the titanium contained in said powder, the extent of said incorporation, permeation and absorption of said titanium being inversely proportional to its distance from that surface of the metallic body through which titanium has entered it. The titanium appears to be absorbed, or to have permeated, as aforesaid, in minute subdivisions or particles, which are found conglomerated with the metal constituting the said metallic body, or is, as it were, alloyed with said metal with however the notable characteristic that other things being equal the respective number of said particles so to speak, in different planes projected through said metallic body in parallelism with that surface thereof which is proximate to said plane is inversely proportional to the distance of such plane from such surface. There is thus imparted to the metallic body treated, where and to the extent required, and without resort to mechanical means, as drilling or the like, and also without resort to fusion, an actual content of titanium conglomerated therewith, and this without dis-

torting or substantially changing the form of the metallic body, or article treated, thereby imparting thereto new and desired characteristics, properties, capacities and behavior.

That those skilled in the art may better understand my procedure, I will mention, for illustration, the following examples, viz: I have treated, by my said process, a ferric body, *i. e.* a steel disk, said disk being one-half inch in thickness and five inches in diameter as follows, viz: In an ordinary graphite receptacle I packed the said disk in powdered ferro-titanium (the alloy of iron and titanium) pulverized to pass through a 60 inch mesh, or finer. Said ferro-titanium contained about 20% of titanium and 80% of iron. I closely packed said powdered ferro-titanium on all sides of said disk. The graphite receptacle, and its said contents, were then, in a crucible, raised to a temperature indicated by a bright yellow heat and maintained in this temperature during about four hours. The said disk on cooling and removal from the remaining powder was found to contain, near its surface, from 0.65% to 0.72% of titanium, said titanium having been apparently as aforesaid absorbed by the steel, and imparting thereto, where present, greatly increased toughness and hardness. On another occasion a similar disk of copper was treated in all respects as before, except that it was packed in powdered cupro-titanium (the alloy of copper and titanium) containing about 90% of copper and 10% of titanium, and in this instance, the copper disk, at the conclusion of the operation, was found to contain, near its surface 2.72% of titanium, with corresponding similar increase of toughness and hardness. I have further discovered that the amount of such other metal absorbed or incorporated into the metallic body treated by my process as aforesaid, and the degree of the penetration of such other metal into such metallic body, may, within limits, be regulated as desired by varying the proportion of such other metal in the powder in which the metallic body is packed, or by varying the duration of the said treatment. Thus the absorption, or impregnation, may be extended from the surface inwardly, even to the center of the metallic body treated, and its final content of the added metal varied, within limits, at

will. It will be observed that the treatment afforded by my said process may be confined to any desired surface, or part, of the metallic body by correspondingly limiting the location of the packing to such surface or part.

Ferro-titanium containing carbon as graphite may be employed in the same way as above described respecting ferro-titanium practically free from carbon. The metallic body treated in these instances however will be found to have absorbed, in addition to the titanium, some carbon.

The manifold utilities of my present invention will be obvious to those skilled in the art. Steel armor plate, for instance, can thereby be hardened and toughened at or near its surface by incorporation there of titanium, and thus new and desirable qualities, such as hardness, imparted to the plate near its surface without affecting the normal elasticity, or other desired qualities of the steel throughout the remainder of said plate.

The temperature required, as aforesaid, for the practice of my said process may be produced and applied to the materials employed, in any convenient manner, depending upon the character, size, etc., of the metallic body treated, as for instance in a gas furnace, in an open hearth direct coke fire, or electrically as by a resistance or otherwise.

The annexed drawing indicates symbolically the supposed arrangement and relative location of the absorbed, or permeating metal, in fragment of a steel plate A shown

in section without hatchings, the dots suggesting the relative location and extent of the particles of incorporated metal extending from each surface of the plate inwardly.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is the following, viz:—

1. The method of treating steel which comprises packing against the surface thereof a powdered alloy of iron and titanium and heating the mass to a degree lower than the melting point of said steel until some of said titanium has been absorbed by and incorporated into said steel.

2. The method of treating a ferric body which comprises packing against the surface thereof a powdered alloy of titanium with ferric metal and heating the mass to a degree lower than the melting point of ferric metal until some of said titanium has been absorbed by and incorporated into said body.

3. The method of treating a metallic body consisting of metal other than titanium which comprises packing against the surface thereof a powdered alloy of titanium with said other metal and heating the mass to a degree lower than the melting point of, and until some of said titanium has been absorbed by and incorporated into, said other metal.

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