

# UNITED STATES PATENT OFFICE.

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## PROCESS OF NICKEL-PLATING.

SPECIFICATION forming part of Letters Patent No. 734,522, dated July 28, 1903.

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*To all whom it may concern:*

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, Orange, in the county of Essex and State of New Jersey, have invented a certain new and useful Improved Process of Nickel-Plating, of which the following is a description.

My invention relates to nickel-plating; and its object is to produce an adherent coating of metallic nickel on iron or steel by electrolytic deposition.

The process can be carried out in connection with sheets or other blank forms, which are subsequently drawn, stamped, or pressed into desired shapes, and it can also be carried out for the nickel-plating of iron and steel articles having their ultimate shape.

In carrying the invention into effect I proceed as follows: Iron or steel sheets or articles made from iron or steel, whether in sheet form or cast or wrought, are first electroplated with a thin coating of nickel in an ordinary electrolytic bath. The sheets or articles are then preferably piled or nested together, so as to occupy as small a space as possible, and are placed in a cast-iron chamber or clay retort, which is closely sealed. A non-oxidizing atmosphere is then created in the chamber or retort, preferably by passing hydrogen gas through the same to displace the air therein. The sheets or articles are now subjected to a temperature sufficient to weld the film of nickel to the iron or steel backing while the non-oxidizing gas is passing, after which the chamber or retort and its contents are cooled down below the oxidizing-point while the articles or sheets are still surrounded by the gas, whereupon the latter may be removed and a fresh charge introduced into the chamber. I find in practice that the sheets or articles should be heated to a bright yellow, at which point the nickel welds to the iron or steel, so that it becomes integral with it, and at the same time the surface of the nickel becomes very bright. The weld, in fact, between the nickel and the iron or steel is so perfect that sheets plated in this way can be formed into various articles by the drawing or stamping process without crack-

ing or flaking the film, which is not the case when the film has not been subjected to the welding process. In fact, I find that no matter how carefully sheets of iron or steel may be electroplated with nickel any attempt to draw or stamp articles therefrom results in the cracking or flaking of the nickel coating, owing to the condition of tension of the latter, which condition is relieved by the welding process described. The welding process also serves also to anneal the sheets for the first operation of drawing.

So perfect is the result secured by my process that cans and dishes made thereby may be substituted in many cases for similar articles made of tinned iron plates by known processes. Nickel articles made by my process can be produced more cheaply than those made from tinned iron, since the thickness of the nickel film is very much less than the thickness of the tin coating on the latter articles.

Having now described my invention, what I claim is—

1. The process of forming an adherent coating of metallic nickel on iron or steel, which consists in electrolytically depositing metallic nickel on the iron or steel, and in then subjecting the nickel-plated iron or steel to a welding temperature in a non-oxidizing atmosphere, substantially as set forth.
2. The process of forming an adherent coating of metallic nickel on iron or steel, which consists in electrolytically depositing metallic nickel on the iron or steel, and in then subjecting the nickel-plated iron or steel to a welding temperature in an atmosphere of hydrogen gas, substantially as set forth.
3. The process of forming an adherent coating of metallic nickel on iron or steel, which consists in electrolytically depositing metallic nickel on the iron or steel, in then subjecting the nickel-plated iron or steel to a welding temperature in a non-oxidizing atmosphere, and in permitting the iron or steel to cool below the oxidizing-point while it is maintained in such atmosphere, substantially as set forth.
4. The process of forming an adherent coating of metallic nickel on iron or steel, which consists in electrolytically depositing metallic

nickel on the iron or steel, in then subjecting the nickel-plated iron or steel to a welding temperature in an atmosphere of hydrogen gas, and in permitting the iron or steel to cool below the oxidizing-point while still subjected to the action of such gas, substantially as set forth.

This specification signed and witnessed this 11th day of February, 1902.

THOS. A. EDISON.

Witnesses:

J. F. RANDOLPH,  
J. A. BOEHME.