

UNITED STATES PATENT OFFICE.

JOSEPH ELTON BOTT, OF EYAM, COUNTY OF DERBY, ENGLAND.

MANUFACTURE OF ORDNANCE, &c.

SPECIFICATION forming part of Letters Patent No. 463,224, dated November 17, 1891.

Application filed January 2, 1891. Serial No. 376,519. (No model.) Patented in England December 5, 1889, No. 19,557, and December 18, 1889, No. 20,380; in Italy May 28, 1890, XXIV, 27,557, and December 24, 1890, XXV, 28,819; in Sweden May 28, 1890, No. 2,846; in Belgium May 29, 1890, No. 90,732, and November 18, 1890, No. 92,763; in France May 29, 1890, No. 205,964, and November 18, 1890, No. 209,597; in Spain August 6, 1890, No. 10,866; in Austria-Hungary October 4, 1890, No. 23,450, and April 22, 1891, No. 57,457, and in Germany November 17, 1890, No. 58,358.

To all whom it may concern:

Be it known that I, JOSEPH ELTON BOTT, a subject of the Queen of Great Britain, residing at Eyam, in the county of Derby, England, have invented certain new and useful Improvements in the Art of Manufacturing Composite Metallic Bodies, such as Ordnance and Armor-Plates, (the same having been patented by me in Austria-Hungary, No. 23,450, dated October 4, 1890, and No. 57,457, dated April 22, 1891; in Belgium, No. 90,732, dated May 29, 1890, and No. 92,763, dated November 18, 1890; in France, No. 205,964, dated May 29, 1890, and No. 209,597, dated November 18, 1890; in Italy, No. 27,557, Vol. XXIV, dated May 28, 1890, and No. 28,819, Vol. XXV, dated December 24, 1890; in Spain, No. 10,866, dated August 6, 1890; in Sweden, No. 2,846, dated May 28, 1890; in Germany, No. 58,358, dated November 17, 1890, and in Great Britain, No. 19,557, dated December 5, 1889, and No. 20,380, dated December 18, 1889;) and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

In the manufacture of smooth-bore and rifled ordnance as at present carried out it is usual to shrink hoops of steel concentrically round the inner tube of the gun to be re-enforced. This necessitates most costly and accurate workmanship, and even then the act of shrinking on the hoops of hot metal leaves the gun-tube subject to unknown and most severe strains, more especially so in the case of guns intended to be bored hexagonally on the Whitworth system, instead of being rifled in the ordinary manner.

My method of constructing ordnance is as follows: I first prepare a suitable gun-tube of proper temper, and where it is intended to construct the gun with a hexagonal bore I first rough-bore or mill out the tube to its approximate twisted hexagonal shape. I next prepare the tube (in either case) for receiving the outer jacket of tough steel, as follows: First, the said tube is coated with nickel, (pref-

erably by electricity.) The reason for my coating the tube with nickel being that electrical or magnetic deposition of nickel acts in a different manner to that of the deposition of other metals, the plating of which can be easily stripped off, while my coating of nickel is partially absorbed by the process of deposition on the steel tube, a combined chemical and magnetic action taking place. Another reason for my using nickel is that, unlike other metals, it is very slowly oxidizable even at considerably high temperatures, thus retaining its value as a protecting medium to the steel tube until the molten steel forming the re-enforcing jacket is actually cast on, and at the moment of casting the upper surface of the nickel alloys with the molten steel and the compound is absorbed into the nickel-saturated pores of the steel tube, which are expanded by the heat of the molten steel, and the subsidiary film of nickel steel so formed becomes a medium for uniting the tubes to the jacket. The gun-tube, being hollow, is preferably filled with asbestos fiber or other refractory material, and each end is stopped with a suitable plug, to which is attached pipes capable of transmitting through the fiber a stream of oil or water at considerable pressure, so as to rapidly cool the tube from the circumference of the bore while the process of casting the jacket is being accomplished. By this means the inner tube contracts first, the molten metal following it up while in a plastic condition, and all the evil effects of unequal shrinkage, as is the case in the superimposition of hoops, is avoided, and a gun is quickly produced of even large caliber without any of the uncertain elements accompanying the ordinary methods hitherto in use.

In applying my invention to the manufacture of compound armor-plates and similar articles by casting steel or an alloy of steel with other metals onto a base of wrought-iron, I proceed as follows: The wrought-iron portion of the armor-plate or other similar articles is first made in any well-known or suitable manner. It is then cleaned or pickled, and a coating of nickel is deposited thereon

by electricity, or such coating may be applied thereto in any other convenient and suitable manner. The said finished or prepared wrought-iron plate or backing is then placed
 5 in a suitable mold after having been heated to a welding heat, and steel or an alloy of steel and other metal, or both, is then cast on, so as to dispense with rolling. By these means I produce an armor-plate or other similar
 10 article having a wrought-iron foundation or backing covered or protected by a tough and moderately hard shield of steel, or of nickel, or of other alloyed steel, or both.

If it is desired to make an armor-plate or
 15 other similar article having a still harder coating or shield, I cast a hard-steel face on the top of a compound plate prepared in the manner as above described. In effecting this I heat the compound plate, prepared as above
 20 described, to a welding heat, and then pour on the required amount of steel to produce the desired face, if the said compound plate has had a coating or layer of steel, or of alloyed steel having a percentage of nickel,
 25 which is sufficient to prevent oxidation. If it has not had such a coating or layer, I first clean or pickle the said compound plate and then plate or otherwise coat the same with nickel, after which I heat the said nickel-protected
 30 compound plate to a welding heat, place the same in a mold, and then pour on the required amount of steel.

By electroplating or otherwise coating the surface with nickel, as herein described, the
 35 plate, when heated to a welding heat, is protected against oxidation, as nickel is very slowly oxidizable, even at considerably high temperatures, thus retaining its value as a protecting medium until the molten metal is
 40 actually cast onto the nickel-protected plate, by which means the intimate union or welding together of the various layers forming the combined plate is secured.

Plates constructed as herein described may
 45 be employed as armor for vessels, forts, and other buildings or places, or they may be used in the construction of safes and doors of strong rooms, or for other purposes where such a description of plate is required.

The principal reason why I choose nickel 50 as the combining medium is because of its acting as a perfect preventive from oxidation of a steel gun-tube or a plate at high temperatures, as I find that no other metal capable of being electrically deposited on iron 55 has this attribute.

Of course I am aware that small articles have been coated with various substances—such as tin, copper, &c.—previous to other metals being cast thereon; but such metals, 60 being volatile at a temperature much below that of molten steel, are absolutely of no use for the purpose of protecting a gun-tube from oxidation during the operation of casting round the same. 65

Having fully described my invention, what I desire to claim and secure by Letters Patent is—

1. The improvement in the art of manufacturing composite metallic bodies, such as 70 ordnance and armor-plates, which consists in applying to a metallic foundation-piece a coating of nickel, then heating the same to a welding heat, and then casting upon the nick- 75 eled body a covering or layer of another kind or quality of metal, substantially as described.

2. The improvement in the art of manufacturing composite metallic bodies, such as ordnance and armor-plates, which consists in applying to a metallic foundation-piece a 80 coating of nickel and then casting upon the nickeled body a covering or layer of another kind or quality of metal, substantially as described.

3. The improvement in the art of manufac- 85 turing composite metallic bodies, such as ordnance and armor-plates, which consists in electroplating with nickel a metallic foundation-piece and then casting thereon a cover- 90 ing or layer of another kind or quality of metal, substantially as described.

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