

# UNITED STATES PATENT OFFICE.

HENRI SCHNEIDER, OF LE CREUZOT, FRANCE.

PROCESS OF MANUFACTURING THE ALLOYS OF STEEL AND NICKEL.

SPECIFICATION forming part of Letters Patent No. 415,655, dated November 19, 1889.

Application filed December 3, 1888. Serial No. 292,518. (No specimens.)

*To all whom it may concern:*

Be it known that I, HENRI SCHNEIDER, manager of the firm Schneider & Cie., of Le Creuzot, (Saône-et-Loire,) in the Republic of France, manufacturers, have invented Improvements in the Process of Manufacturing the Alloys of Steel and Nickel, of which the following is a specification.

This invention relates to the manufacture on the hearth or bed of a furnace, as hereinafter described, of steel alloyed with nickel, whereby a product is obtained which is employed in the construction of ordnance, armor-plates, gun-barrels, projectiles, and other articles for military or other like purposes—commercial sheets or bars, for example. In order to manufacture this combination or alloy of steel and nickel upon a bed or hearth in such a manner as to obtain a homogeneous steel free from flaws or hollows, it is necessary, on the one hand, to avoid oxidizing the nickel before it forms the alloy with the iron, and, on the other hand, it is necessary to cause the incorporation to take place at as early a stage as possible in the operation, or immediately on the commencement of the fusion or liquefaction. This result is attained, according to this invention, by introducing the nickel by the aid of a preliminary melt or mixture in fusion, containing, say, for example, about thirty per cent. of nickel, sixty-three per cent. of iron, three per cent. of carbon, and two of manganese and silicon, this melt being placed on the hearth or bed of the furnace together with a suitable proportion of iron or scrap-steel.

In my concurrent application of even date, Serial No. 292,520, I have described the production of an alloy of cast-iron and nickel. This alloy may be used in the production of an alloy of steel and nickel, either while yet in the molten condition or after cooling and hardening. The alloy of cast-iron and nickel, instead of being formed separately, may be formed in the furnace before proceeding with the subsequent operations, though it is preferred to form it separately. In case it is formed in the furnace itself a bed of anthracite is first prepared in the furnace and the nickel is placed thereon with the requisite proportion of iron or steel. The whole is then covered with anthracite in order to protect the metal from contact with the air during

the fusion. When the charge is melted, the excess of anthracite is removed and charges of iron or scrap are added in succession. Waste or scrap steel alloyed with nickel obtained by preceding operations is to be employed in these charges, preferably in the first. From this time the operation is conducted on the hearth or open furnace in the same way as in making ordinary steel, care being at the same time taken to continually protect the bath from oxidation by means of a layer of slag or cinder, which is renewed as required, and also to take precautions to prevent redshortness in the metal before the final introduction of the recarbonizing and manganiferous silico-spiegel iron or ferromanganese.

The steel manufactured according to this invention usually contains about five per cent. of nickel—a quantity sufficient to impart a remarkable degree of strength to the product; but the invention is not limited to this proportion.

Steel alloyed with nickel according to this invention is especially adapted or suitable for use in the construction of ordnance, armor-plates, gun-barrels, projectiles, and other articles employed for military or other like purposes, or the manufacture of commercial sheets, bars, and the like. The percentages of carbon, silicon, and manganese can be regulated according to the degree of hardness required; but in all cases, in order to obtain the best result possible, the product must invariably be tempered in an oil or other bath.

I claim as my invention—

The herein-described process of manufacturing a homogeneous alloy of steel and nickel by first forming an alloy of cast-iron and nickel rich in the latter metal, as specified, and charging such alloy into a furnace of the character indicated, with the usual ingredients for the production of steel, and continuing the operation in the ordinary way, as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HENRI SCHNEIDER.

Witnesses:

CHARLES BRÉNOY,  
LÉON FRANCKEN.