

# UNITED STATES PATENT OFFICE.

HENRI SCHNEIDER, OF LE CREUZOT, FRANCE.

PROCESS OF MANUFACTURING THE ALLOYS OF STEEL AND COPPER.

SPECIFICATION forming part of Letters Patent No. 415,654, dated November 19, 1889.

Application filed December 3, 1888. Serial No. 292,517. (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 Copper, of which the following is a specification.

This invention relates to the manufacture, either in the crucible or on a hearth, of steel containing variable proportions of copper, and to the employment of this steel in the manufacture of ordnance, armor-plates, gun-barrels, projectiles, or other military purposes, being also applicable in the manufacture of commercial sheet metal or bars and the like.

In manufacturing the compound metal or alloy of steel and copper according to this invention, either in a crucible or on a hearth, I employ an alloy or compound of cast-iron and copper, which may be prepared according to the process described in my application of even date, Serial No. 292,519. This alloy is charged into the bed of a furnace with the ordinary ingredients used in the manufacture of steel, preferably under a layer of anthracite to avoid oxidation. It is important that the copper be introduced at as early a stage in the process as possible. The said alloy of cast-iron and copper may be introduced either while yet melted or after cooling and hardening; or it may be prepared in the furnace itself, where the operation of manufacturing the steel is carried on. In the latter case the bed of anthracite is first prepared and the copper placed thereon with a suitable quantity of cast or pig iron. The whole is then covered with anthracite, in order to protect the metal from contact with the air during fusion. When the charge is melted, the excess of anthracite is removed and successive charges of iron or scrap added, the operation being then continued in the ordinary way, care being taken to continually protect the bath from oxidation by means of a layer of slag or cinder, which may be renewed as required, and also to prevent redshortness in

the metal before the final introduction of the recarbonizing and manganiferous silico-spiegel iron or ferro-manganese.

The steel produced according to this invention generally contains from about two to four per cent. of copper, this being a sufficient quantity to impart to the metal the qualities of elasticity, strength, and malleability to a remarkable extent; but the invention is not limited to these proportions.

The steels alloyed with copper are especially useful in the manufacture of ordnance, armor-plates, gun-barrels, projectiles, and other military purposes, or in the manufacture of commercial sheets, bars, and the like. They may be combined with varying amounts of carbon, manganese, or silica or silicium, according to the degree of hardness required and the purpose for which they are employed. They may be obtained in the form of ingots, being subsequently forged or rolled, or in the form of castings, and in order to obtain the best results it is preferable to temper them either with water, oil, or otherwise.

I claim as my invention—

1. In the manufacture of steel, the improvement which consists in forming an alloy of cast or pig iron and copper in approximately the proportions indicated and converting the same into a steel alloy in a crucible, open-hearth, or like furnace, substantially as described.

2. In the manufacture of steel, the improvement which consists in forming preliminarily an alloy of cast-iron and copper rich in the latter metal, charging such alloy into a furnace with the ordinary ingredients for the production of steel, and continuing the operation in the usual way, substantially as described.

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.