UNITED STATES PATENT OFFICE.

JAMES CHURCHWARD, OF NEW YORK, N. Y.

SELF-HARDENING ALLOY OF IRON AND STEEL.

No. 832,773. Specification of Letters Patent. Patented Oct. 9, 1906.

Application filed May 17, 1906. Serial No. 317,347.

To all whom it may concern:

Be it known that I, JAMES CHURCHWARD, a subject of the King of Great Britain, residing in the borough of Manhattan, in the city, county, and State of New York, have invented certain new and useful Improvements in Self-Hardening Alloys of Iron and Steel, of which the following is a specification.

The present invention relates to alloys of iron and steel, and particularly the latter, where nickel is employed as one of the alloying metals; and the object of the invention is to produce a self-hardening metal, as will be hereinafter described, which will be suitable for many uses and purposes.

In carrying out the present invention there is mixed with pure refined iron or steel relatively small proportions of nickel, tungsten, chromium, manganese, and vanadium, and the alloy is melted and cast into the proper shapes.

A suitable proportion of the several metals for producing a self-hardening tool-steel will be understood from the following formula, in which the proportions are designated in percentages by weight: pure steel, containing sixty per cent. carbon, ninety; nickel, five; tungsten, one; chromium, 2.50; manganese, one; vanadium, 0.50; total, one hundred.

The carbon may be added to the iron or steel in many known ways, and it may vary from .20 to 1.0 per cent., according to the uses to which the alloy is to be applied. The percentages of the alloying metals may also be varied to some extent for the same reason. For example, these metals may vary in proportion as follows: steel, from eighty-four to ninety per cent.; nickel, from four to six per cent.; tungsten, from 0.5 to 1.5 per cent.; chromium, from 2.5 to three per cent.; manganese, from 0.5 to one per cent., and vanadium, from 0.25 to 0.5 per cent.

It is believed that the alloying elements named react on each other to produce chemical and molecular changes of such a nature that the tungsten, chromium, and manganese are permitted to harden the steel, while the vanadium removes or prevents brittleness and imparts toughness without softening the alloy. Ferro compounds of the several alloying metals may be used in lieu of the pure metals.

Having thus described my invention, I claim—

An alloy composed of the following metals in about the proportions given, namely: steel, containing about .20 to .60 per cent. of carbon, eighty-four to ninety per cent.; nickel, four to six per cent.; tungsten, 0.5 to 1.5 per cent.; chromium, 2.5 to three per cent.; manganese, 0.5 to one per cent., and vanadium 0.25 to 0.5 per. cent.

In witness whereof I have hereunto signed my name, this 16th day of May, 1906, in the presence of two subscribing witnesses.

JAMES CHURCHWARD.

Witnesses:
WILLIAM J. FIRTH,
H. G. HOSE.