

UNITED STATES PATENT OFFICE.

ROBERT A. HADFIELD, OF SHEFFIELD, ENGLAND.

PROCESS OF IMPROVING THE MAGNETIC QUALITIES OF IRON-SILICON ALLOYS.

No. 836,754.

Specification of Letters Patent.

Patented Nov. 27, 1906.

Application filed February 27, 1906. Serial No. 303,149.

To all whom it may concern:

Be it known that I, ROBERT A. HADFIELD, a subject of the King of Great Britain, residing at Parkhead, Sheffield, England, have invented a certain new and useful Improvement in Processes for Improving the Magnetic Qualities of Iron-Silicon Alloys, of which the following is a specification.

In United States Letters Patent No. 745,829, granted to me December 1, 1903, I have set forth a method of producing a magnetic material of high permeability and low hysteresis action, which consists in alloying a magnetic body with silicon, heating the alloy to a relatively high temperature below its melting-point, allowing the alloy to cool, reheating it to a temperature below that first employed, and allowing it to cool slowly.

In my present process I improve the magnetic qualities of the alloy treated by a single heating, followed by slow cooling, thus eliminating reheating and the subsequent cooling stage.

The alloy employed must be one low in carbon and manganese and having as its principal constituents iron, together with from one to five per cent. of silicon or any element or elements equivalent to silicon in the same combination. The composition and range of ingredients of such an alloy may be as follows: iron-silicon from one to five per cent., manganese up to five-tenths of one per cent., and carbon up to fifteen-hundredths of one per cent. I carry my process into effect by first heating said alloy to a temperature above a critical point (hereinafter defined) and then cooling said heated alloy slowly. A resulting product is obtained having greater permeability and a lower hysteresis quality than is exhibited by

the best commercial Swedish charcoal-iron. When the said alloy is subjected to progressive rising temperature variations, (below fusion,) it undergoes at a certain temperature-point an apparent molecular change, and on further alteration of temperature another point ensues at which another molecular change occurs. The term "critical point" in the claims means the point of higher temperature of the two above-noted and corresponds and approximates to the 900° centigrade point in the case of pure iron, which is the lower limit of its so-called "gamma" state.

In practice I have satisfactorily performed my process by subjecting the said alloy to a temperature of 1,050° centigrade and then cooling it at the approximate rate of ten degrees per hour.

I claim—

1. The process of increasing the permeability and reducing the hysteresis action of an alloy low in carbon and manganese and containing iron with from one to five per cent. of silicon, which consists in heating the said alloy to a temperature above its critical point and then subjecting it to cooling only.

2. The process of increasing the permeability and reducing the hysteresis action of an alloy low in carbon and manganese and containing iron with from one to five per cent. of silicon, which consists in heating the said alloy to a temperature above its critical point and then subjecting it to slow cooling.

In testimony whereof I have affixed my signature in presence of two witnesses.

ROBERT A. HADFIELD.

Witnesses:

G. H. HEMSOLL,
E. RODGERS.