

UNITED STATES PATENT OFFICE.

WILLIAM BEARDMORE, OF GLASGOW, SCOTLAND.

STEEL ALLOY.

1,007,055.

Specification of Letters Patent.

Patented Oct. 31, 1911.

No Drawing.

Application filed December 5, 1910. Serial No. 595,721.

To all whom it may concern:

Be it known that I, WILLIAM BEARDMORE, a subject of the King of Great Britain, residing at Parkhead Forge Rolling Mills and Steel Works, Glasgow, Scotland, have invented certain new and useful Improvements in Steel Alloys, of which the following is a specification.

This invention relates to the manufacture of steel, the chief object being to provide a steel alloy or composition for use more particularly in making armor plates and gun tubes, and to obtain the requisite properties which are desirable in steel intended for these purposes by using only a comparatively small percentage of carbon.

According to this invention the steel besides having a low percentage of carbon contains metallic constituents other than ferrite, which constituents are of such a character and are used in such proportions that the strength and toughness of the steel are afforded by the solution of the said constituents in the ferrite. The proportion of carbon in the steel is so low that the hardening carbon formed on heating the steel above the first critical point Ac_1 (but not above the second critical point Ac_2) has little effect upon the toughness. The carbon should not exceed .25 per cent. The most important of the metallic constituents I employ are molybdenum and nickel.

The composition of a steel which I have found satisfactory is as follows:—carbon 0.15 to 0.25 per cent., molybdenum 1.00 to 2.00 per cent., nickel 5.00 to 7.00 per cent., tungsten not exceeding 3.00 per cent., manganese not exceeding 0.70 per cent. In addition to the above stated constituents the steel would contain some small percentage of sulfur and phosphorus which however should of course be as small as possible.

Steel of a composition similar to that above stated is suitable not only in the manufacture of gun tubes and armor plates but also for certain classes of armor and shields for small guns. Owing, however, to the unusually low percentage of carbon, the steel does not harden by mere quenching when hot, sufficiently to impart to it a face of the extreme hardness necessary for the purpose above mentioned, and the steel must there-

fore be subjected to a process of cementation. Not until after the steel has had its face cemented and differentially hardened does it possess the requisite extreme face hardness.

By suitably regulating the degree and extent of differential treatment to which the steel plates may be subjected, it is possible to secure great hardness in some parts while retaining at other parts a ductile and tough condition. In the case of armor plates the qualities possessed by the steel enable them after cementation to resist the penetration of modern capped projectiles and at the same time to resist the racking action of the projectiles, particularly in the case of plates of less thickness than the caliber of the guns used in attacking them. In the case of steel for gun tubes, an increased resistance to bursting or cracking of the tube by the shock of discharge is obtained.

What I claim and desire to secure by Letters Patent of the United States is:—

1. Steel for use in the manufacture of armor plates, containing in addition to the usual ferrite, a percentage of carbon not exceeding .25, and molybdenum and nickel in proportions sufficient to compensate for the deficiency in the strength and toughness of the steel due to the low percentage of carbon.

2. Steel for use in the manufacture of armor plates, containing, in addition to the usual ferrite, a percentage of carbon not exceeding .25, and molybdenum, nickel, and tungsten, in proportions sufficient to compensate for the deficiency in the strength and toughness of the steel due to the low percentage of carbon.

3. Steel for use in the manufacture of armor plates, comprising, in addition to the usual ferrite, .15 to .25 per cent. of carbon, 1.00 to 2.00 per cent. of molybdenum, 5.00 to 7.00 per cent. of nickel, tungsten not exceeding 3.00 per cent., and manganese not exceeding 0.70 per cent.

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

WM. BEARDMORE.

Witnesses:

A. M. MITCHELL,
HARMON O. AUSTIN