

UNITED STATES PATENT OFFICE.

WALTER RÜBEL, OF HAMBURG, GERMANY.

ALLOY.

No. 906,937.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WALTER RÜBEL, a subject of the King of Prussia, residing at Hamburg, Free and Hanse town, in the German Empire, have invented certain new and useful Improvements in Alloys, of which the following is a full, clear, and exact description.

The qualities of steel, used for casting in molds or intended for rapid turning tools must be of an exceptional nature with regard to density, failing which the steel would never fulfil the requirements of practice the wear and tear especially causing great expense with steel of inferior density.

All kinds of methods have been tried for the production of steel suitable for the above mentioned purposes, for instance different other metals have been added to rough steel in greater or smaller quantities; all these efforts were however unsuccessful. By my process however extremely dense steel without fissures or cracks but of great strength is produced, showing a high limit of elasticity.

To obtain such steel I melt iron and nickel or iron and manganese, or iron, tungsten and chromium in such proportions together, as to represent their atomic weights and then add 3% of vanadium-carbid to the alloy, formed by melting.

I employ chemically pure iron for my alloy. The addition of carbid of vanadium increases the temper and strength of the material in an unforeseen manner, especially at high temperature, giving a perfectly equal and fine-grained structure.

It is not absolutely necessary, to mix the several parts in atomic proportions, vanadium-carbid having the general effect of improving other kinds of steel alloys, provided not more than 3% is added. The best results however are obtained if the above process is employed.

Instead of adding vanadium-carbid to the alloys containing no carbon or at least very small quantities of carbon, vanadium alone may be added in which case the vanadium-carbid is formed within the alloy itself; of course the steel alloy must contain in this case a sufficient quantity of carbon, to allow of the formation of the vanadium-carbid.

The quantity of vanadium contained in the alloy should not exceed a certain proportion, 0.3 to 3% being the most favorable.

If I wish to obtain for instance steel of a strength as to bear 150 kg. for each square millimeter and of 10% elongation or extension, I first melt the necessary quantity of iron with the nickel, mixing them in such manner, as to have 0.9% of carbon. In melting the percentage is reduced to 0.5, then I add 1.05% of vanadium either as vanadium or as ferro-vanadium and allow the alloy to boil for about two hours. The slag formed absorbs part of the vanadium, leaving but about 1% in the alloy.

Supposing the formula of the vanadium-carbid to be VC_2 and the atomic weights of vanadium and carbon to be 51.2 and 12, the above mentioned quantities are sufficient to allow of the formation of vanadium-carbid. I proceed in exactly the same manner, if the alloy is to contain chrome, manganese or tungsten instead of nickel.

Nickel-steel produced according to this process shows the above mentioned strength, which has not yet been obtained by other processes, having at the same time a comparatively small elongation or extension and a high limit of elasticity. An especially great advantage consists in that such steel can be hardened or cemented in a cold current of air, which renders it especially suitable for armor-plates, which can only be hardened on one side.

What I claim as my invention and desire to secure by Letters Patent is:

1. An alloy of iron and another metal in proportions representing their atomic weights, with vanadium carbid.

2. An alloy of iron and nickel with vanadium carbid.

3. An alloy of iron and nickel in proportions representing their atomic weights, with vanadium carbid.

In witness whereof, I subscribe my signature, in presence of two witnesses.

WALTER RÜBEL.

Witnesses:

ERNEST H. L. MUMMENHOFF,
OTTO W. HELLMRICH.