Patented Mar. 2, 1926.

1,574,782

# UNITED STATES PATENT OFFICE.

ERICH BECKER, OF KLADNO, CZECHOSLOVAKIA, ASSIGNOR TO POLDIHÜTTE, OF PRAHA-VINOHRADY, CZECHOSLOVAKIA, A JOINT STOCK COMPANY.

## NONMAGNETIC STEEL.

No Drawing. Application filed May 25, 1925. Serial No. 32,830.

*To all whom it may concern:*

Be it known that I, ERICH BECKER, citizen of the German Republic, residing at 1340 Riegrova, Kladno, Czechoslovakia, have invented certain new and useful Improvements in Nonmagnetic Steel, of which the following is a specification.

This invention relates to the production of non-magnetic steels.

Nickel-manganese steels containing about 10–15 per cent of nickel and about 5 per cent of manganese are almost non-magnetic, but so far as their capabilities for being worked are concerned they have a low yield point, for instance, about 35–40 kg. per square millimeter. Chromium containing nickel-manganese steels with about 10 to 15 per cent of nickel and 6 to 4 per cent of manganese are known which are almost non-magnetic steels and moreover machinable. A higher drawing limit than that given above can only be obtained if the steels are forged or rolled at a comparatively low and narrow compass of temperature. Even so, only irregular and non-reliable quality figures are obtained.

According to this invention it has been ascertained that far better results may reliably be obtained with manganese-nickel steels of higher manganese content than those given above.

The invention consists in producing manganese-nickel steels containing 6 to 15 per cent of manganese, 17–4 per cent of nickel and an appreciable quantity up to 10 per cent of chromium. The content of chromium may be replaced in known manner wholly or in part by molybdenum or vanadium or by both of these metals.

Such alloys have not hitherto been produced or examined because it was assumed that they would be unworkable on account of the high content of manganese and furthermore because it was believed that they would possess, like high-alloyed manganese steel, a low drawing limit and in their natural state also a low elongation.

Experiments conducted with the steel alloys of this invention in their natural state, that is to say without heat treatment, show that very high drawing limits of up to 70 kgs. per square millimeter and more may be obtained for Austenitic steels and with high stretching powers.

The following quality figures have, for instance, been found with steels produced in accordance with this invention:—

Drawing limit 15 kg. per square millimeter; tensile strength 98 kg. per square millimeter; stretching at a measuring-length of $1-11.3\sqrt{F}$, 40 per cent; reduction of area, 55 per cent.

The high drawing limit and elongation possessed by the steels of this invention are extremely important because of the constantly increasing uses and claims on non-magnetic materials, for example for end rings for turbo-generators, the number of revolutions of which are repeatedly being increased.

The new steels possess in addition the economical advantage of being cheaper than the hitherto known alloys on account of their comparatively lower content of nickel. Even with such lower-nickel-content the new steels are superior to the known alloys both in regard to their mechanical as well as their magnetic properties, because they are almost entirely non-magnetic, whereas the known steels always exhibit more than a trace of magnetic property.

What I claim and desire to protect by Letters Patent is:—

1. A non-magnetic steel having a high yield point and elongation in its normal condition, such steel containing from 6 to 15 per cent of manganese; from 17 to 4 per cent of nickel; and at least one metal having similar properties to chromium in appreciable quantity up to 10 per cent.

2. A non-magnetic steel having a high yield point and elongation in its normal condition, such steel containing from 6 to 15 per cent of manganese; from 17 to 4 per cent of nickel; and chromium in appreciable quantity up to 10 per cent.

In testimony whereof I affix my signature.

DR. ING. ERICH BECKER.

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## DISCLAIMER

1,574,782.—*Erich Becker*, Kladno, Czechoslovakia. NONMAGNETIC STEEL. Patent dated March 2, 1926. Disclaimer filed March 14, 1932, by the assignee, *Poldihütte*.

Hereby enters this disclaimer by disclaiming from the scope of the claims all nonmagnetic steels of the character described in which the content of the manganese is 10 to 15%, to thereby include only such steels where the manganese content is not more than 9½% and not less than 6%.

[*Official Gazette April 5, 1932.*]