July 30, 1940. E. HOUDREMONT ET AL. 2,209,622

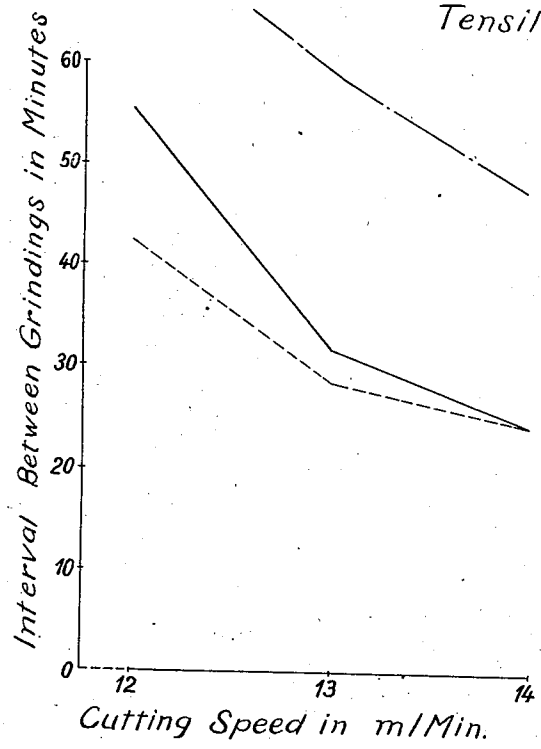
HIGH SPEED STEEL

Filed Feb. 24, 1938

		C	Cr	Mo	V	W
------	Steels with	0.80	4.52	—	2.40	14.8
———	" "	1.35	4.27	3.25	4.69	—
—·—·—	" "	1.35	4.03	3.18	4.83	3.06

Feed: 1.4 mm. Depth of Cut: 5.0 mm.

Test Shaft: Cr-Ni Steel of 100 Kg/mm² Tensile Strength



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HIGH SPEED STEEL

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Application February 24, 1938, Serial No. 192,288
In Germany March 31, 1937

2 Claims. (Cl. 75—126)

The invention relates to high speed steels which according to the invention contain from 1.0 to 1.6% carbon, from 1.0 to 6.0% chromium, from 1.0 to 6.0% molybdenum, from 2.0 to 6.0% vanadium, the remainder substantially being iron with the normal impurities.

It has been found that these new steels, although they contain only relatively small quantities of alloy constituents, are equivalent and frequently even superior to the known high alloy high speed steels. So, for instance, as may be seen from the drawing, a tool manufactured from a steel of a composition according to the invention and containing 1.35% carbon, 4.27% chromium, 3.25% molybdenum, and 4.69% vanadium, that is, containing only relatively small quantities of alloying constituents, shows at high cutting speed practically the same time up to re-grinding as a tool manufactured from a high alloy steel containing 0.8% carbon, 4.52% chromium, 2.4% vanadium, and 14.8% tungsten. At lower cutting speeds the first-named steel is even superior to this latter high alloy steel.

When compared with high speed steels having a high molybdenum content, but which do not equal new steels in efficiency, the new steels according to the invention further afford the advantage that they are cheaper and in manufacture, owing to their comparatively small molybdenum content, do not require so great care to avoid volatilisation of the molybdenum and decarbonisation as is necessary in forging and in the heat treatment of high speed steels of high molybdenum content.

The ratio of efficiency to degree of alloying is most favorable with such steels according to the invention, which besides iron with the normal impurities contain from 1.2 to 1.5% carbon, from 3.0 to 5.0% chromium, from 3.0 to 5.0% molybdenum, and from 4.0 to 6.0% vanadium.

It has further been found that the cutting capacity of the above-described steels is improved still more by an addition of tungsten amounting at least to 50% of the molybdenum content and ranging from 1.0 to 4.0%. So, for instance, as may be seen from the drawing, a turning tool manufactured from a high speed steel containing 1.35% carbon, 4.27% chromium, 3.25% molybdenum, and 4.69% vanadium, shows in turning chromium-nickel steel of a strength of 100 kg/mm.^{2}, with a feed of 1.4 mm. and a depth of 5.0 mm., a time up to re-grinding of about 32 min. at a cutting speed of 13 m. per min., and a time up to re-grinding of about 24 min. at a cutting speed of 14 m. per min., whilst a high speed turning tool of a steel containing 1.35% carbon, 4.03% chromium, 3.18% molybdenum, 4.83% vanadium, and 3.06% tungsten, at a cutting speed of 13 m. per min. shows a time up to re-grinding of about 59 min. and at a cutting speed of 14 m. per min. a re-grinding time of 48 min.

In addition to the constituents hereinbefore quoted the high speed steels according to the invention may further contain up to 5% cobalt.

What we claim and desire to secure by Letters Patent is:

1. A high speed steel consisting of 1.0–1.6% carbon, 1.0–6.0% chromium, more than 1.0% and less than 5.0% molybdenum, 2.0–6.0% vanadium, remainder substantially all iron with the normal impurities.

2. A high speed steel consisting of 1.2–1.5% carbon, 3.0–5.0% chromium, at least 3.0% and less than 5.0% molybdenum, 4.0–6.0% vanadium, remainder substantially all iron with the normal impurities.

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