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WILLIAM A. WISSLER, OF ELMHURST, NEW YORK, ASSIGNOR TO HAYNES STELLITE COMPANY, A CORPORATION OF INDIANA

METAL-CUTTING TOOL AND ALLOY FOR MAKING THE SAME

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The invention comprises a group of alloys suitable as material for metal cutting tools and other purposes, and includes tools made from such alloys. Many of the compositions to be described exhibit sufficient hardness even when heated to redness to permit their use for cutting such metals as cast iron and steel, and they are therefore suitable materials for high-speed cutting tools.

The alloys are essentially composed of chromium and tungsten with varying amounts of nickel and small but important percentages of boron and carbon. In most cases cobalt is also present. The cobalt can be replaced in whole or in part by iron, but alloys containing considerable proportions of cobalt are preferred for most uses. Manganese and silicon can be incorporated in small quantities to deoxidize the alloys and make them easier to cast. A considerable variety of other chemical elements may enter the alloy from the raw materials or from utensils which come into contact with the molten metal, but these have no special effect when present in the quantities so introduced.

The chromium content may vary from about 15% to about 40% and the tungsten content from about 15% to about 35%. Carbon and boron, particularly the latter, harden the alloy. I prefer a boron content between 0.5% and 2.5%, and a carbon content between 0.75% and 2.5%. The nickel may constitute any fraction of the balance up to 50% of the alloy. Nickel tends to toughen the alloy and simultaneously to soften it slightly, but the softening effect is not great enough to preclude the presence of as much as 50% nickel in a useful alloy if the other components are in proper proportion within the limits set herein. The influence of the nickel appears to be proportional to the quantity present and a minimum of about 5% is required to produce an appreciable effect. When the nickel content is more than about 15% the alloys can be cast in graphite molds, and this leads to economies in producing articles from the alloys since graphite molds are easily prepared. With the nickel content below about 15%, a mold of less chilling capacity should be used.

It will be apparent that while chromium, tungsten, and nickel may be practically the sole metallic constituents of the alloy, there may also be a large proportion of other metal or metals present. As already stated this balance may comprise iron or cobalt or both.

The following are typical compositions which were found to cut much better than standard high-speed steels under suitable test conditions:

	A	B	C
	Percent	*Percent*	*Percent*
Ni	25	30	5
Co	13	0	38
Fe	1	10	3
Cr	33	33	25
W	22	23	25
B	2.2	1.8	1
C	1.5	1.4	1.3

I claim:

1. A tool having a working edge composed of an alloy containing chromium 15% to 40%; tungsten 15% to 35%; boron 0.5% to 2.5%; and carbon 0.75% to 2.5%, with the remainder principally nickel, the nickel content being not greater than 50%.

2. A tool having a working edge composed of an alloy containing chromium 15% to 40%; tungsten 15% to 35%; boron 0.5% to 2.5%; and carbon 0.75% to 2.5%, with the remainder principally nickel, the nickel content being between 15% and 50%.

In testimony whereof, I affix my signature.

WILLIAM A. WISSLER.