

UNITED STATES PATENT OFFICE

2,105,583

RAZOR BLADE AND STEEL THEREFOR

Elbridge J. Casselman, Pittsburgh, Pa., assignor
to Magazine Repeating Razor Company, a corporation of New Jersey

No Drawing. Application January 13, 1937,
Serial No. 120,404

1 Claim. (Cl. 30—350)

This invention relates to steel alloys, and consists in an alloy of unique composition and in a razor blade of superior excellence produced therefrom. This application is a continuation in part of an application filed by me February 29, 1936, Serial No. 66,440.

The invention has particularly to do with the production of razor blades of ribbon type. In order to produce these articles the material of which they are made must be susceptible to being rolled to ribbon form; it must be susceptible to hardening in heat-treating furnaces of continuous type; it must be susceptible to sharpening in continuous machinery. All these characteristics are requisite to large-scale production. And the blade that is produced must have durability in sharpness of edge.

I have made extensive study of the qualities of razor blades produced from steels and steel alloys of various composition. In this study I have employed the machine for testing the sharpness of blades that is described in United States Letters Patent No. 1,983,597, granted on my application December 11, 1934; and I have discovered facts not heretofore known about the sharpness of the edges of razor blades. The procedure of my study was this:—The sharpness of each blade under study was first measured, and its edge was examined under the microscope. The blades were then used repeatedly by trial shavers, upon whom prior determination had been made and determination reached with accuracy, what relatively were the dulling effects of these individuals in their use of razor blades in shaving. After each shave the sharpness of the blade was again measured and the blade was again examined microscopically, and record was made of the report of the shaver as to the comfort and the ease of shaving. The blades after use were set aside and were used again after periods of rest that ranged from five minutes to several days.

By such study I discovered that chromium is unique among the constituents of steel alloys in prolonging the useful life of razor blades. In the course of study the following particular matters came to light:—

1. Surveying the wider field, that includes both carbon steels and chromium steels, and comparing razor blades formed of steels that differ in composition or in heat treatment or both, wide differences are found to exist in the ease with which the blades may be sharpened. The tougher and the softer the substance of the blade, the more difficult it is to sharpen it.

2. It is characteristic of blades formed of carbon steel that the degree of dulling per shave is directly related to the minute formation of the edge. For example, if the beveled margin of the blade is 0.001 inch wide, and if upon this margin an edge of 45° be imposed, sharpness will be less durable than if a 40° edge be imposed on a beveled margin 0.0003 inch wide.

3. It is a further characteristic of blades formed of carbon steel that the rate of dulling, though fairly constant during the earlier part of the term of useful life, increases rapidly toward the end of the term. The blades change rapidly from useful to useless condition.

4. In the case of blades formed of chromium steels, the larger the chromium content, the greater the difficulty of overcoming the toughness that hinders and of attaining the hardness that facilitates sharpening.

5. It is characteristic of razor blades formed of chromium steels that their durability or rate of dulling is less closely related to the minute formation of the edge than in the case of blades formed of carbon steel. In the comparison given above between a blade with a 0.001 inch margin sharpened to a 45° angle and a blade with a 0.0003 inch margin sharpened to a 40° angle, durability was found to be equally as good in the two cases.

6. It is characteristic of a razor blade formed of chromium steel that the rate of dulling, instead of increasing, actually diminished toward the end of the useful life of the blade. The blade changes slowly from useful to useless condition.

7. Specifically, I discovered that in the case of razor blades formed of chromium steel alloys in which the chromium content is as great as 6% and in which the carbon content is as great as 1%, though in no case as great as 2%, durability of sharpness is attained and the regeneration of sharpness, that in other cases progresses slowly as the blade rests idle after use, progresses with relatively great rapidity; that further increase, beyond 6%, of the magnitude of the chromium content has little or no effect in hastening the recovery of sharpness; that increase to as much as 8% is undesirable, in that the difficulties of rolling, hardening, and sharpening are too greatly increased; and that best results for use in razor blades are attained when the chromium content ranges from 6 upward but is less than 8%, while the carbon content is at least 1%. Decrease of the carbon content below 1% has effect in increasing the difficulties of hardening and of sharpening.

I believe myself to be the discoverer of the phenomenon that razor blades of chromium steel, of 4% chromium and upwards, possess a unique capacity of edge regeneration. A blade of such material will, twenty-four hours after use, reveal edge regeneration in appreciable degree. Carbon-steel blades will manifest no appreciable regeneration within twenty-four hours, nor any effect in any period of time comparable with that of chromium-steel blades.

The chromium steel of my invention is a steel alloy consisting essentially of chromium and iron; the carbon content is as specified; and the contents of manganese, silicon, sulphur, and phosphorus are such as are usually in non-alloyed steel.

By way of illustration, I have caused to be fabricated to razor blades of ribbon type, by such commercial processes as I have indicated, two lots of chromium steel of the general composition just indicated, in which the chromium contents were alike (6-8%) and the carbon contents were, in one 1.20% and in the other 0.80%. The lot whose carbon content was 1.20% presented no greater difficulty in rolling than did the other lot; while it was readily susceptible to hardening. The lot whose carbon content was 0.80% was found to be difficult to harden.

The rolled ribbon of the carbon content of 1.20% was then fabricated into razor-blade blanks, and these were sharpened by a commercial process, in substantially identical manner as blades of carbon steel are sharpened. The blades were found to have equal initial sharpness with blades of carbon steel sharpened in like manner; in service they revealed the superior qualities that have already been described; and their term of usefulness was from 20% to 150% longer than that of the best carbon-steel blades. The wide range in the percentage just given is due to the fact that the ultimate discarding of the blades was a matter of choice with those who used them—that is to say, of the trial shavers.

I claim as my invention:

A razor blade of ribbon type, readily susceptible to rolling hardening and sharpening, and having the capacity of rapid recovery of sharpness, formed of chromium steel whose chromium content is as great as 6% and not as great as 8%, whose carbon content is not less than 1% nor greater than 2%, whose contents of manganese, silicon, sulphur, and phosphorus are such as are usual in non-alloyed steel, and whose composition is otherwise made up of iron.

ELBRIDGE J. CASSELMAN.