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HACK SAW BLADE

William H. Shortell, Greenfield, and Leslie D. Hawkrige, Newton, Mass., assignors of one-half to Millers Falls Company, Greenfield, Mass., a corporation of Massachusetts, and one-half to Hawkrige Brothers Company, Boston, Mass., a corporation of Massachusetts

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This invention relates to hack saw blades, and more particularly to hack saw blades of a new composition of steel and having various useful new characteristics.

This invention represents certain improvements and further discoveries relating to the subject-matter of our co-pending application, Serial No. 139,434, filed April 28, 1937.

The primary object of the invention is to provide a hack saw blade having the combined characteristics of hardness and toughness.

Another object of the invention is to provide a hack saw blade capable of use with equal facility on both bar and sheet metal, whether the metal is hard or soft.

Further objects and advantages of the invention will in part be obvious and will in part appear from the following description, wherein all specific examples and figures are to be construed as illustrative only, and the scope of application of the invention will be indicated in the claims.

Blades constructed in accordance with this invention have been found to have a combination of qualities and characteristics never before united in a single blade. Previously, hack saw blades were necessarily designed for particular purposes and could not be used interchangeably. Thus a blade intended for use on hard metal would strip its teeth or break if used on sheet metal. On the other hand, a blade tempered for toughness for cutting sheet metal would be useless on harder materials. Among the attempted solutions to the problem were also blades with hard teeth tempered on a softer, tougher back. The blades of this invention, however, are of even temper throughout, and have such combined qualities of hardness, toughness and flexibility that they can be used with equally great facility and efficiency on hard or soft metals in either bar or sheet form.

In our above identified co-pending application, the explanation was advanced that the above results are due in some way to some special qualities imparted to the alloy by the molybdenum in the particular proportions in which it is combined with the carbon and manganese content. Recent further research, however, make it appear that this explanation was not sufficiently broad, since equivalent results have now been obtained without the use of molybdenum.

In accordance with the practice of the present invention, it has been discovered that various

other elements may be substituted in whole or in part for the molybdenum content disclosed in our said copending application. It appears, therefore, that the special qualities possessed by the blades of the invention result primarily from the use of carbon in hypo-eutectoid proportions combined with relatively high manganese content and with another element which will combine with carbon rather than go into solution in the ferrite, the whole combination being in balanced proportions. Among the elements found suitable are vanadium, tungsten and chromium. Any one of the three may be used alone, or either vanadium or tungsten may be combined with a suitable amount of chromium.

Accordingly, the following tables are given as examples of the general range of percentages of components of alloys suitable for the practice of the invention:

Example 1

	Per cent
Carbon	.50-1.00
Manganese	.50-1.50
Silicon	.10-.50
Molybdenum	.50-1.50
Chromium (optional)	.10-.50

Example 2

	Per cent
Carbon	.50-1.00
Manganese	.50-1.50
Silicon	.10-.50
Vanadium	.25-1.00
Chromium (optional)	.10-.50

Example 3

	Per cent
Carbon	.50-1.00
Manganese	.50-1.50
Silicon	.10-.50
Tungsten	.50-3.00
Chromium (optional)	.10-.50

Example 4

	Per cent
Carbon	.50-1.00
Manganese	.50-1.50
Silicon	.10-.50
Chromium	.25-3.00

The remainder of the alloy in each case is essentially iron plus the usual small quantities of phosphorus and sulphur ranging downwards from about .02% for each element.

As typical specific illustrations, the blades of

the invention may be composed of steels having the following analyses:

Example 1

	Per cent	
Carbon.....	.73	5
Manganese.....	.70	
Silicon.....	.24	
Phosphorus.....	.018	
Sulphur.....	.019	10
Vanadium.....	.63	

Example 2

	Per cent	
Carbon.....	.68	15
Manganese.....	.72	
Silicon.....	.24	
Phosphorus.....	.016	
Sulphur.....	.018	
Tungsten.....	1.55	20

The process of manufacture of the blades of this invention is substantially conventional. The body of the blade is made by shearing and blanking from sheets of the proper gauge, which are first formed by rolling, hammering, or other suitable operation from an ingot of steel having a suitable analysis such as one of the examples listed above. The teeth are formed in the usual or any suitable way, and the blade is then heat treated in order to harden it.

It has been discovered that in the manufacture of blades according to this invention, this hardening process is most important and must be carried on at a very limited temperature range. The ideal temperature appears to be in the neighborhood of 1510° F. and should not be allowed to vary to an appreciable extent from this figure if the combined qualities of toughness and cutting efficiency are to be achieved in the finished blade. Thus if the blades are heated above about 1550° F., they will cut satisfactorily but will be lacking in toughness. On the other hand, should they be heated only to about 1470° F., they will have the toughness characteristic of the product of this invention but will be lacking in cutting efficiency.

It will be understood that the invention is not limited, necessarily, to the specific details herein illustrated and described, but it will be apparent that such details are subject to various modifications which become apparent readily to one skilled in the art, without departing from the spirit of the invention; and it will be understood, therefore, that it is intended and desired to include within the scope of the invention such modifications and changes as may be necessary to adapt it to varying conditions and uses.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

Having described our invention, what we claim as new and desire to secure by Letters Patent is:

1. As a new article of manufacture, a hack saw blade composed of steel containing .61-1.00% carbon, .50-1.50% manganese, .10-.50% silicon, and .50-3.00% tungsten, the remainder being essentially iron.

2. As a new article of manufacture, a hack saw blade composed of steel containing .61-1.00% carbon, .50-1.50% manganese, .10-.50% silicon and .25-1.00% vanadium, the remainder being essentially iron.

3. As a new article of manufacture, a hack saw blade composed of steel containing .61-1.00% carbon, .50-1.50% manganese, .10-.50% silicon, and .25-3.00% chromium, the remainder being essentially iron.

4. As a new article of manufacture, a hack saw blade composed of steel containing .61-1.00% carbon, .50-1.50% manganese, .10-.50% silicon, and .50-1.50% molybdenum, the remainder being essentially iron.

5. As a new article of manufacture, a hack saw blade composed of steel containing .61-1.00% carbon, .50-1.50% manganese, .10-.50% silicon, .50-1.00% molybdenum and .10-.50% chromium, the remainder being essentially iron.

6. As a new article of manufacture, a hack saw blade composed of steel containing .61-1.00% carbon, .50-1.50% manganese, .10-.50% silicon, .50-3.00% tungsten, and .10-.50% chromium, the remainder being essentially iron.

7. As a new article of manufacture, a hack saw blade composed of steel containing .61-1.00% carbon, .50-1.50% manganese, .10-.50% silicon, .25-1.00% vanadium, and .10-.50% chromium, the remainder being essentially iron.

8. As a new article of manufacture, a hack saw blade composed of steel containing approximately .75% carbon, .70% manganese, .24% silicon, and .63% vanadium, the remainder being substantially iron with low percentages of phosphorus and sulphur.

9. As a new article of manufacture, a hack saw blade composed of steel containing approximately .68% carbon, .72% manganese, .23% silicon, and 1.55% tungsten, the remainder being substantially iron with low percentages of phosphorus and sulphur.

10. As a new article of manufacture, a hack saw blade composed of steel containing .65-.70% carbon, .80-.90% manganese, .75-.85% molybdenum, and approximately .25% silicon, the remainder essentially iron.

11. As a new article of manufacture, a hack saw blade composed of steel containing .61-1.00% carbon, .50-1.50% manganese, .10-.50% silicon, and the following elements: molybdenum, tungsten, vanadium, and chromium, to a total quantity of .50-1.80%, the remainder being essentially iron.

WILLIAM H. SHORTELL.
LESLIE D. HAWKRIDGE.