

bonded diamond hones and even more compared to metal bonded types. At the same time, it is exceptionally wear resistant, exhibiting up to double the life of resinoid bonded hones for the same diamond depth, as well as unusual resistance to grooving.

Because of their characteristic sharper cutting surface, vitrified bonded diamond hones require only occasional dressing to remove any slight glaze or steel load that may have been picked up.

For best all-around results, 320 grit in the single end hone (type DH1) and 220/320 in the double end (type DH2) are most satisfactory. Coarser grit sizes, such as 100, 120 and 150 are available, if desired, as well as 400 and 500 in a very fine grit size.

The intelligent use of a diamond hand hone cannot but extend the life of carbide tools between regrinds, as a result of which savings in both carbide tools and grinding wheels are realized and the nominal cost of the diamond hone itself is soon absorbed.

To dress or true a vitrified bonded diamond hone, hand lap the diamond surface carefully on a flat metal plate. Use water and Crystolon grain of approximately the same size as the diamond in the hone.

CHAPTER VII

Sharpening Single-Point Tools (High-Speed Steel and Cast Alloy)

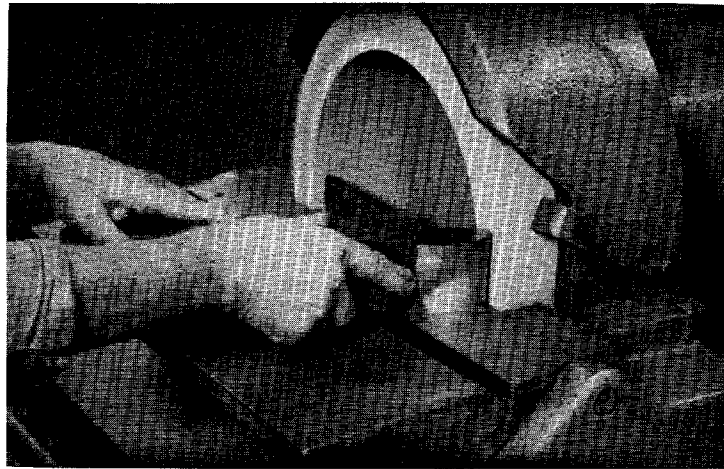
High-Speed Steel Tools

The prime characteristic of high-speed steels is their property of "red hardness" or the ability of the tool to maintain a cutting edge when heated to a temperature that would destroy the cutting qualities of the carbon steels formerly used.

Of the various types of high-speed tool steels made today, two are quite common: the well known tungsten type such as 18-4-1 or T1 (AISI-SAE designation), and the newer and increasingly popular molybdenum type such as M2 in which molybdenum is substituted for a portion of the tungsten. Larger percentages of vanadium are also used in present day high-speed steels to give greater hardness as, for example, M3 and M4 type tool steels.

For a comprehensive discussion of the present day tool steels—their classification in terms of their grinding characteristics, and a new method of selecting wheels for grinding them, write for a copy of Norton booklet F-1158.

In grinding high-speed steel tools there are certain precautions to observe. Wet grinding is preferable to dry, provided the supply of water is sufficient to flood the work; a small dribble of water is worse than no water at all. When grinding dry, softer wheels should be used than when grinding wet. Furthermore, the grinding wheel should be run toward the cutting edge—from the tip to the shank of the tool, wherever



Sharpening a large cast alloy tipped planer tool offhand on 14" tool grinder

possible—to prevent burning the edge. For the same reason, when grinding high-speed steel tools offhand, the tool must be kept constantly in motion.

Cast Alloy Tools

So-called cast alloy tools are nonferrous wear-resisting alloys of cobalt, chromium and tungsten. The group of cutting alloys known by this name has long been used for machining cast iron, malleable iron and semi-steel, as well as some of the nonferrous metals. They have high inherent hardness, require no heat treatment, stand higher cutting speeds than high-speed steels and retain their hardness at a red heat. In addition to the familiar tool bits, they are available in the form of milling cutter blades, welded tip tools and all forms of special tools.

Because of their somewhat more brittle character, cast alloy tools, wherever it is practical to do so, should be ground with more support for the cutting edge than carbon or high-speed steel tools require. In general, there should be just enough relief or clearance to permit the tool to cut freely. For machining steel, however, the same rake and relief angles are recommended as for high-speed steel tools.

Grinding Wheels Recommended

The following wheels are recommended for grinding lathe and planer tools of either high-speed steel or cast alloy:

Offhand Grinding:

Bench and pedestal grinders:

| | | |
|--------------|------------|-------------------|
| Coarse | 44A36-OVBE | Alundum vitrified |
| Fine | 44A60-MVBE | Alundum vitrified |

Wet tool grinders:

| | | |
|----------------------|-----------------|-------------------|
| Up to 20" wheels ... | 19A36-O5VG | Alundum vitrified |
| 24" and larger | } or 44A24-MVBE | Alundum silicate |
| | | Alundum vitrified |

Machine Grinding:

Straight wheels:

| | | |
|------------------------|------------|-------------------|
| Sellers—15" diameter . | 44A36-LVBE | Alundum vitrified |
| Sellers—24" diameter . | 44A24-MVBE | Alundum vitrified |

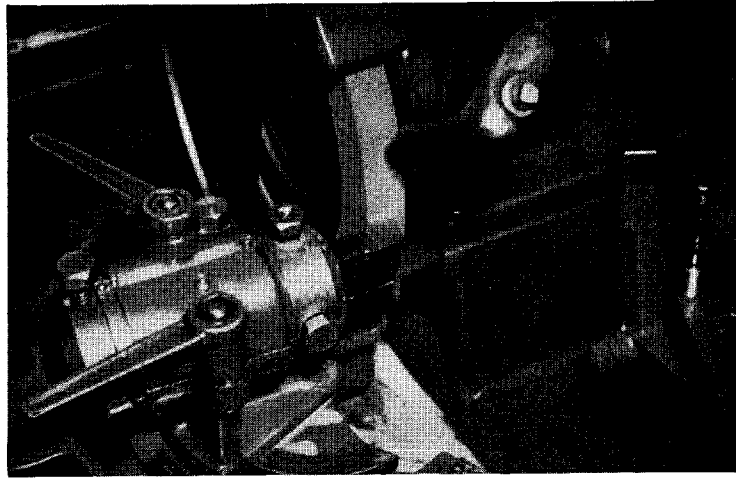
Cup or cylinder wheels:

| | | |
|------------------|------------|-------------------|
| Gisholt | A24-L5VBE | Alundum vitrified |
| Sundstrand | 19A46-K5VG | Alundum vitrified |

Cutting Off Tool Bit Stock:

| | | |
|---------------------------|----------|-------------------|
| Cut-off type wheels | A60-M8B2 | Alundum vitrified |
|---------------------------|----------|-------------------|

Tools used for fine finishing or for cutting soft metals should be stoned lightly with an India oilstone after grinding.



Machine grinding the side relief angle of a lathe tool

as the finish is largely dependent upon the keenness of the edge of the tool. For heavy roughing cuts on steel, there is no point in stoning the cutting edge. Here, a fine edge is actually undesirable as it will last only a few feet of cutting, then round off to a more solid edge and remain in approximately this same condition until the tool breaks down.

Tool Shapes

The shape of the tool, as well as the proper rake and relief angles, depends upon a large number of factors, such as the type of machine on which the tool is to be used (lathe, planer, boring mill, etc.), the specific operation, the material to be cut and the material from which the tool is made. Some of the large users of lathe and planer tools make it a practice to design their own tools for each operation. Drawings are made

of the tools and from these drawings the tools are sharpened each time to the specified angles.

Similarly, many of the manufacturers of tool bits, tool holders and tool grinding machines have each designed their own shapes of "standard" tools which they recommend for use with their machine. This information is usually available in convenient chart form and in the case of the Sellers and Gisholt tool grinders, includes machine settings for reproducing the recommended angles.