

Grinding a Drill by Hand

One of the traits of a good machinist is his ability to recognize a dull tool and be able to re-sharpen it accurately and quickly. Good workmanship depends upon the sharpness of your cutting tools. To grind a drill by hand:

1. Examine the drill to check its condition. If it is dull or the margins near the point are worn or burned off, it will be necessary to grind off the entire point and re-grind a new one.

2. During the sharpening use a drill-point gage (Fig. 27-10).

3. Use the coarse grinding wheel first if much metal is to be ground away. Finish on the smooth wheel. Grinding wheels should be dressed and trued before you start.

4. To hold a drill correctly for grinding, place the forefinger of one hand on the tool rest of the grinder. Either the right or the left hand may be used, whichever comes naturally. Place the drill on the forefinger. With the thumb grasp the drill just snug enough to hold it steady against the wheel. Hold the drill by the shank with the other hand.

5. Place the lip against the grinding wheel while holding the drill at an angle of approximately 59 degrees from the face of the wheel. With a little experience you will soon be able to judge this angle quite accurately. It is seldom, if ever, necessary to have this angle exact. To help you position the drill angle, aim the drill straight at the wheel face. Then move the drill shank to the left about 30 degrees.

This leaves a difference of 60 degrees for the cutting-lip angle. It is quite easy to judge 30- and 60-degree angles after some practice.

6. The movement of your hand holding the drill shank is most important. Move the hand downward naturally, and try not to twist the drill as you do so. Your hand as it goes down will follow a slight natural arc without any effort on your part. This puts the correct curve on the surface of the drill back of the cutting edge. When moving the drill back to the starting point for successive grinds, *never* raise the shank end above the level of the cutting lip.

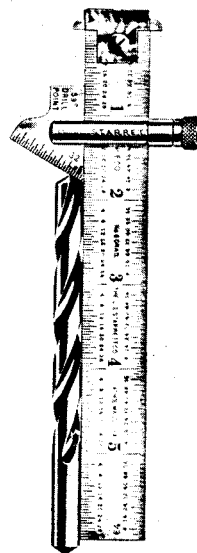


Fig. 27-10. Checking a drill point with a drill-point gage.

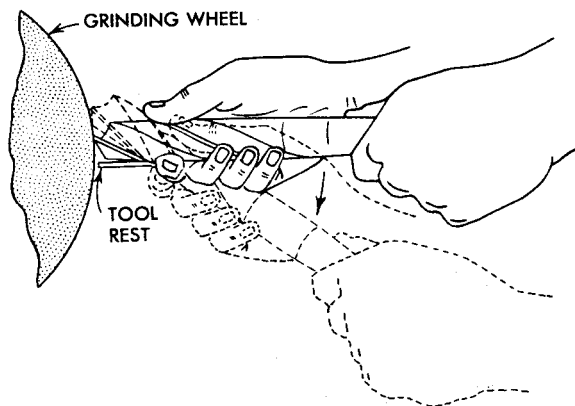
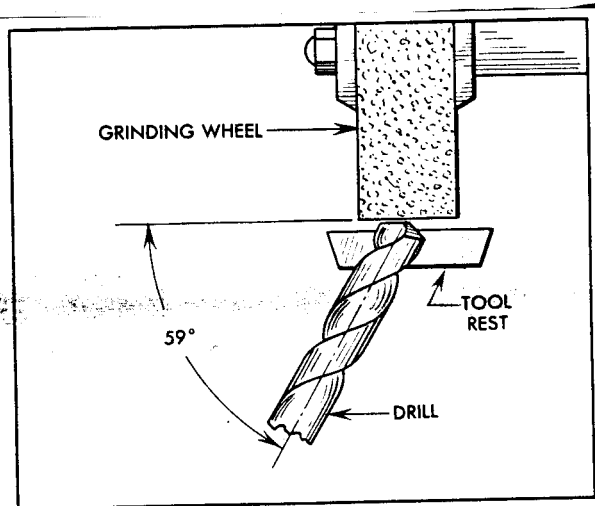


Fig. 27-11. The correct position for grinding a drill.

To do so will give you a negative angle, and the drill will not cut. If you twist the drill as you feed the shank downward, you will grind the cutting edge off the opposite lip (Fig. 27-11).

7. Grind a little at a time off each lip, working toward the center point.

8. Use a drill gage to check as you grind, to make sure that:

- a. The cutting edges are the same length
- b. The cutting edges make an equal angle with the axis—59 degrees
- c. The clearance behind the cutting edges is about 12 degrees

9. Do not apply so much pressure as to overheat the drill point. Carbon drills must be cooled often in water as they are being ground. High-speed-steel drills may be cooled frequently, but it is not good practice to cool a hot drill point in cold water. This sudden cooling may cause cracks in the metal. Let it cool in the air.

10. Avoid these common mistakes in grinding drills:

- a. Not enough lip clearance. The point will rub and heat up rapidly, and the drill may be broken.
- b. Too much lip clearance. This causes the cutting edge to wear or break down rapidly.
- c. One lip longer than the other. This makes the dead center, on which the drill pivots, off-center from the axis, causing the drill to wobble and cut an oversize hole (Fig. 27-12).
- d. Lips at different angles. One lip does all the cutting. The drill will wobble and cut oversize (Fig. 27-13).

11. After the drill has been ground many times, the *web* becomes thicker and drilling becomes difficult. This is true even though the drill has been ground properly. It requires more pressure to force the drill into the metal. To overcome this we *thin the web*. To thin the web, use the sharp corner of the regular grinding wheel. Or use a very narrow wheel with a rounded face, if available. Hold the cutting edge parallel with the side of the wheel. Grind back into the flutes on either side until the web is about as thick as that of a new drill of the same size.

Fig. 27-12. Here is what happens when the lips are of unequal length.

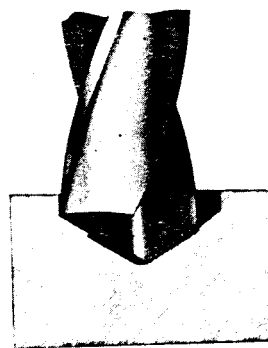
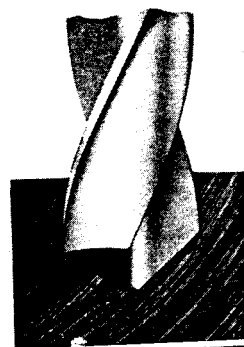


Fig. 27-13. Note that the hole is oversize when the cutting edges are at different angles.



Using a Drill-grinding Attachment

The drill-grinding attachment is very helpful when accurately ground drills are required (Fig. 27-14). It is very difficult for a beginner to grind a drill really accurately by hand.

1. Lay the drill in the V of the attachment.

2. Move the lower support until the drill point is very close to the grinding wheel. Tighten the support.

3. Now turn the micrometer adjustment until one lip just touches the grinding wheel.

4. Move the end of the attachment back and forth to sharpen one cutting edge.

5. Then turn the drill halfway around and sharpen the other cutting edge.

