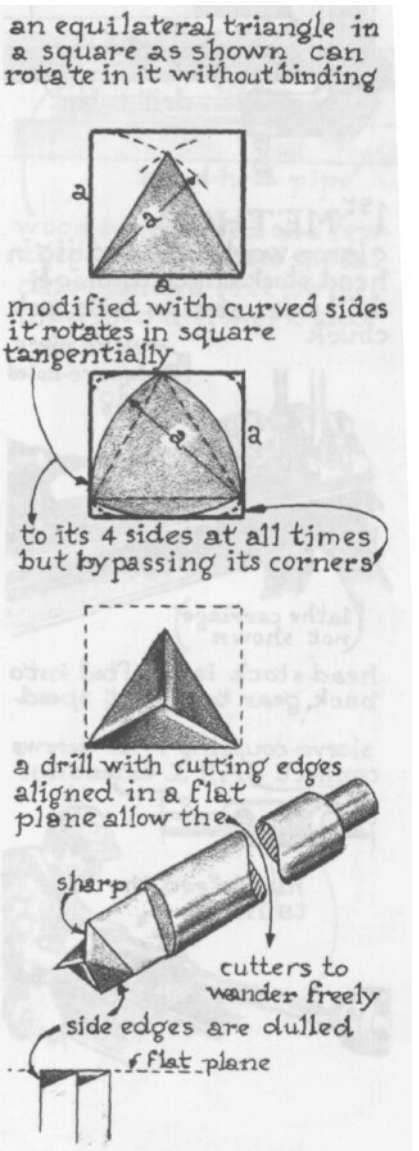
9. How to Drill Square Holes

Admittedly this knowledge is of limited use. There are several ways to make square holes without drilling them and they are preferred by 191. Drilling a square hole actually combines ***drilling*** with ***milling***, during which the tool is guided by a brittle-hard, square-holed jig attached to the workpiece.

In woodworking, square holes are made with drills that rotate within a square, sharp-ended housing that acts as a chisel in the downward thrust. This instrument is a combination drill and broach.

In metalwork, a broach is the instrument that shears the steel in a downward thrust. The four corners around a predrilled hole are cut this way without the use of the drill.

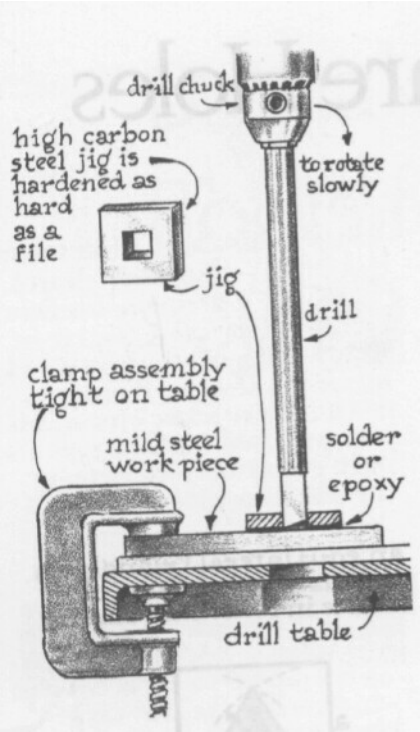


DESIGN PRINCIPLE OF THE CUTTER

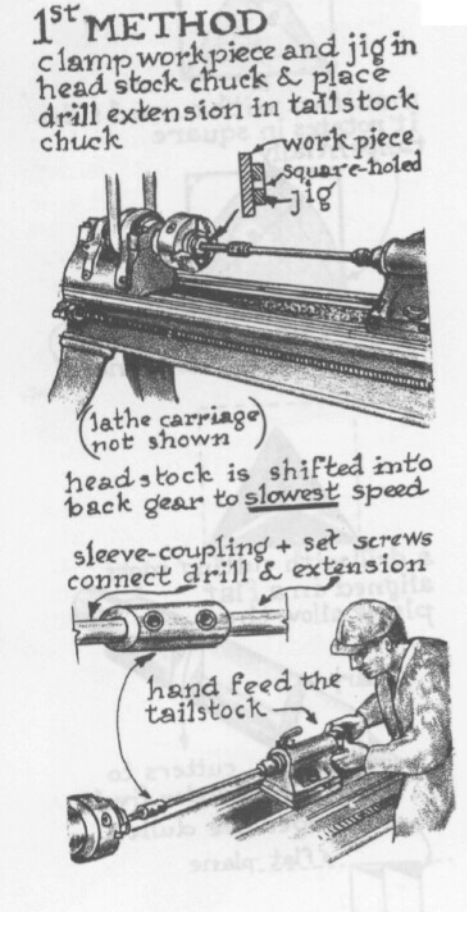
As the illustrations show, the sides of the equilateral triangle placed in the square have the same length as the sides of the square and thus can move within the square without binding. If that triangle is modified into a configuration with curved, instead of straight, sides, it will then move within the limits of the square with three of its sides and one of its points always touching and sliding along the square's sides. The points of this configuration, however, meeting at an angle a little larger than 90 degrees, cannot fit into the square jig's 90-degree comers and must bypass them somewhat. It therefore describes a square with slightly rounded corners.

If the drill is made with sharp corners, straight sides, and a flat cutting-face, it will not act like a regular drill with the cone-shaped profile of its self-centering cutting edges. A cone-shaped cutting profile would cause the drill to seek its center of rotation automatically. With the cutting edges in a flat plane, however, the drill is allowed to wander in whatever direction the cutting forces dictate. It is here that the brittle-hard square jig, when fastened to the workpiece, is used to confine the drill's motions to a wobbling one, forcing it to slide along the square's sides as dictated by the jig, at the same time as it cuts away the steel below it.

It is best to make the drill shank as long as possible in order to cut the sides of the hole as parallel as possible to the axis of rotation, Note that the wobbling action of the milling end is made possible by the springiness of the long drill shank.



The workpiece and jig can be clamped together on the table of the drill press. An alternate arrangement, clamping workpiece and jig in the chuck of a metal-turning lathe that has a long bed, renders the cone effect of the hole negligible. The rod extension of the shank with a sleeve coupling gives us a maximum shank length. Thus the tail-stock is placed at a great distance from the rotating headstock while the drill is fed by the tailstock.



Another method uses a short stubby drill. The combined jig and workpiece are placed on a roller swivel-bearing or on a stack of well-lubricated flat, smooth discs that act as a swivel bearing.

It is amusing to demonstrate the drilling of square holes to unbelievers who are not acquainted with this procedure. I first saw it done on my last day in school in 1923 in Holland, where I was trained to be a marine engineer. The teacher in the machine shop demonstrated how to drill a square hole, thus enlivening the occasion of graduation. But on a later occasion, when I served in the Netherlands East Indies conscript army as a private in the ordnance plant, I was challenged to prove my claim that I could drill square holes. I was given the opportunity to do so, and after witnessing this feat my superiors saw fit to qualify me, then and there, as sergeant instead of private.