Machining angles and vees

By GEOMETER

MANY angular faces and V faces can be machined without difficulty on the lathe, but the accuracy of the results depends upon the use of correct principles. Common examples are outside tapers on shafts, inside tapers in flywheels, and the angular faces of pulleys for V-belts. These are all machined with normal tools, after setting the topslide at the required angles. Other examples are screwcut threads, which must be made with correctly-set vee tools, and angular faces on tubes and V-blocks, which must be machined with cutter bars or milling cutters.

These are just a few of the many examples which could be mentioned. They show the basic principles by which angular faces and V faces can be machined on the lathe.

For screwcutting, a tool must be ground to the included angle of the thread and set square to the work with a gauge, as at A. The gauge is held to the work, and the tool is set to fit in it, with the result that the thread is cut true.

Without a gauge, there is a risk of setting the tool slightly askew to the work. Then the thread is lop-sided; and if it is a large thread, it will bind in a well-fitting nut. It is the same when a nut must be screwcut. The tool must be square, or the result is a lop-sided thread. Sometimes two errors in opposition-one on an outside thread, the other on an inside thread, can prevent parts from fitting together.

Gauges are usually bought for threads which have radii at roots and crests. Whitworth and BA are examples. For V threads and sharp threads, however, accurate gauges can be easily made from two pieces of flat plate. These can be square, though the essential feature is a straight base on each. The two pieces are placed together for drilling, and then a comer is taken off at half the angle of the V, as at Al. It can be done by milling, grinding or turning. Then the two pieces are riveted or bolted to a backing piece, as at A2. The V is square to the straight base which is placed to the work. The principle is similar to that of cutting a piece of folded paper at an angle; the shape is symmetrical when the paper is opened out.

By a variation of the principle, accuracy can be maintained when a V cutter (a rack cutter blank) or a V pulley, as at ***B,*** is machined. A mandrel will mount the work, and the topslide can be set to angle. When one face has been machined, the work is turned on the mandrel-or a centred mandrel can be turned end for end. Then the other face is machined and the V is accurately aligned to the axis of the work.

Often, two faces which make a V can be checked with an angle gauge by turning it over. Thus, as at ***B,*** the gauge tests one face of the V pulley, and is then turned over to test the other face. The gauge is made from two pieces of plate bolted together.

When tubes or pipes are joined, the angle on each piece must be half the total angle of the bend. Then the faces abut without gaps. For a 90 deg. bend, the face on each tube must be 45 deg.

For machining tubes which may be used in structures, a set-up is made on the vertical slide, as at C. Split blocks hold a tube, and the slide is set to angle. Cross feed carries the tube past an end mill or fly-cutter, as shown.

Tubes may be fitted to the outsides of others and brazed or welded to form structures. Machining can be done as at ***D*** with a fly-cutter, or a reamer can be used. To hold a tube, split blocks can be mounted on a plate which is bolted to the cross slide table.

With an angle plate on the vertical slide, a V block can be set up for machining, as at E. It should be located to a backing strip; and may be turned over to machine the other face of the V. This principle is followed in the grinding set-up, as at ***F.***