

# Cutting keyways in shafts

USING the lathe, either planing or milling operations can be employed for cutting keyways in shafts. Planing is always an operation for which the tool is mounted sideways on the slide at centre height, and moved along by the saddle; but milling is more varied and must be adapted to the type of key to be used. Milling with a slotting cutter produces the same type of open-ended keyway as planing-to take a feather or gib key. But a keyway for a sunken key which has rounded ends, both enclosed by the metal of the shaft, must be produced with an endmill. And a keyway for a Woodruff or "half-round" key must be cut with a Woodruff keyway cutter.

Suitable set-ups can easily be made for all these operations; but in milling there are points to observe in regard

to direction of feed of work and of rotation of cutters, and taking up backlash to avoid digging-in.

For planing a keyway, the shaft is held in the chuck, and if it is long so that it requires support from the tailstock, the centre in this should be a cut-away type to allow the tool to enter or leave without damage. The chuck can be fixed by a bar to the lathe bed or by engaging backgear. A flat-bottomed hole where the keyway will end allows planing towards the chuck-regulating the cross-feed, and easing back the tool for return

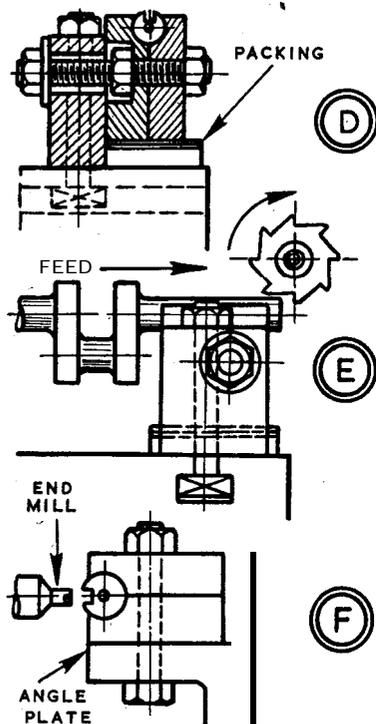
## By GEOMETER

strokes. Alternatively, the tool may be eased out to leave a slope similar to that of slot-milling; though for that type of end, careful feeding in of the tool on successive cuts and planing towards the tailstock may give better results.

In milling with a slotting cutter or Woodruff keyway cutter, backlash should be taken up so that normal rotation of the cutter cannot drag the work forward and cause a dig-in which can result in a broken cutter. It means the shaft must be set for upward feed, or above the cutter for cross-feed, as at A1 and 2; while in cutting a Woodruff keyway, the fixed setting should be made with the backlash taken upwards, as at B.

### Advantages of reverse drive

When a lathe-driving motor will reverse, as is usually the case, there are advantages in running a cutter backwards, with the work mounted on the vertical slide for down feed, or on the slotted cross-slide to pass beneath the cutter with cross-feed. The advantages are that more room is available upwards than downwards for a mounting on the vertical slide, and better support and a longer feed with a front mounting on the cross-slide; than with one at the rear. A slotting cutter can be turned on its mandrel for running backwards; and if a Woodruff keyway cutter is made (from silver steel), a similar shank each side will admit of use either way.



A holder can be provided to fit in the taper of the spindle, as at C, where it can be held by a long bolt.

Split blocks, as at D and E, provide a suitable mounting for each end of a shaft when bolted to fixed blocks, with cuts obtained by packing under the split blocks, the holes in the fixed blocks being oversize or slotted to permit adjustment. One of each pair of split blocks, as shown, may be thicker than the other, for recessing to take the centre nut on the piece of studding. This allows adjustment without loosening the shaft in the split blocks-so that proper alignment is obtained on successive cuts. In many instances, one pair of split blocks, but with two holding studs, and a longer fixed block, will make a satisfactory set-up.

Split blocks when mounted on an angle plate on the vertical slide or cross-slide, as at F, also provide a mounting for a shaft for endmilling a keyway, or milling a keyway for a sunken key-between two drilled flat-bottomed holes. For either operation, with the set-up having no bolts or clamps at the working edge, the endmill can be very stubby-and so without deflection, for the keyway to cut the correct width.

