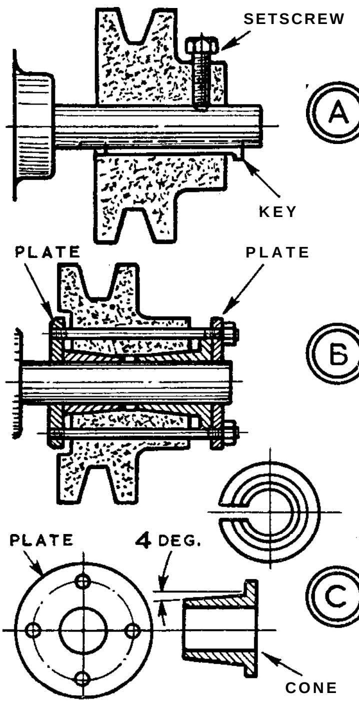
Taper fitting a pulley

By GEOMETER

A TAPER and nut provide reliable means of fitting a component to a shaft, whether the component is a pulley, a flywheel, a gear or a sprocket. By tightening the nut, the bore of the component is forced into very firm contact with the shaft, so that light drive can be transmitted without a key, although a Woodruff key is usually included for security. A puller must be used to remove the component from the shaft.

In the design stage, the shaft and component can be proportioned for this standard fitting. Sometimes, the taper fitting can be provided later by altering a parallel fitting. The shaft is turned down at the end, threaded and tapered; and a bush is made for the component. On occasion, this is not possible, although the circumstances indicate that a taper fitting would be a distinct advantage for security.

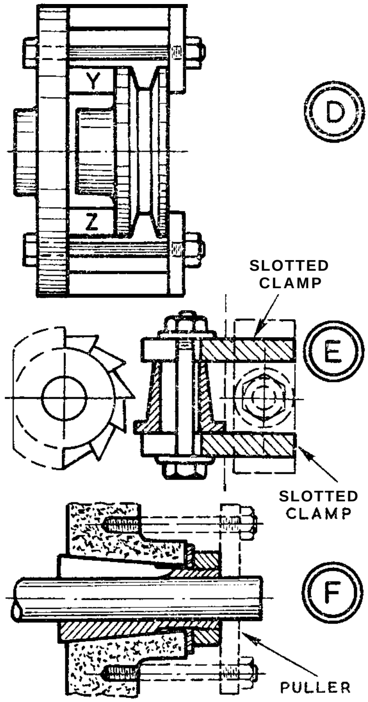


One instance, which recently occurred, involved the fitting of a light-alloy V-belt pulley on a mild steel shaft, as at A. The pulley was a reasonable fit and had a key and setscrew in its boss. But it would keep working loose, perhaps because the driving and driven shafts were connected at right-angles through the single twisted belt. This arrangement had been adopted to keep the drive as simple as possible, for the alternative would have been bevel gearing in addition to the belt and pulleys.

Various means were considered to bold the light-alloy pulley securely, among them the principle of the collet chuck, in which the split collet grips parallel around stock firmly as it is drawn into the body or backplate. It does not matter if the round stock is slightly oversize, or if it is a thou or two small. The split collet accommodates small differences in diameter. You tighten the chuck until the stock is secure. Obviously, this was the method to hold the pulley without one's having to alter the shaft-although, of course, burrs were cleaned off and it was polished smooth.

The pulley is now fitted as at *B* and has not moved since it was first tightened. It was bored out taper each side to take a pair of mild steel split cones, the outer one flanged and the inner one plain. They grip the shaft as they are drawn into the pulley. This is done by a pair of plates with studs and nuts, the pulley being drilled for the studs to pass. The key in the shaft protrudes into the slot in each cone to give a positive drive. Drive between cones and pulley is the friction of the tapers-although the outer cone could have been made with a larger flange for the studs to provide a positive drive. The reason for the flange on this cone, which is shown at C, is to admit of using a claw puller to loosen the assembly.

The taper on the cones is 4 deg. A dummy mandrel was turned to this angle to gauge the tapers in the pulley so that both should be the same. The pulley was set up as at *D*



on the lathe faceplate. For boring the rear side, packing was placed to the faceplate, Y-Z. For boring the boss side, the pulley was clamped direct to the faceplate. With the use of topslide feed, the tapers were opened out until the dummy entered to a scribed line.

Two mild steel off-cuts were used for the cones. Each was chucked, faced, centred and drilled, bored to a good sliding fit on the shaft, rechucked, and faced on the reverse side. To machine the tapers, a stub mandrel was turned for the pieces to be pushed firmly on, one at a time. Each was machined to fit the taper in the pulley, with a distance to draw by the plates. These are in mild steel too, each left with a round bore to contain the key.

After the marking and centring, the plates were drilled and tapped for the studs. The outer one was used as a template to dimple the pulley. For splitting the cones, each was set up between slotted clamps, as at E. These were then clamped to the vertical slide.

Diagram *F* shows a single split cone fitting with a washer and nut which can be used as an alternative for a pulley or outer with a thick boss or web.