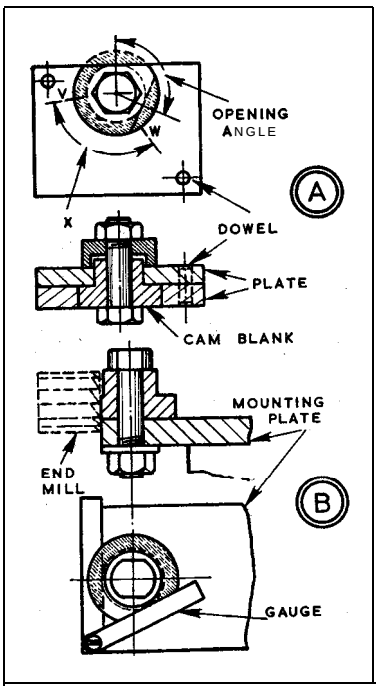
Producing tangential cams

By GEOMETER

ALONE of cams the flat-sided tangential type couples least difficulty in production with the widest choice of methods, for with almost equal facility it can be hand filed, or turned or milled in the lathe. Thus, there is none more suitable for a first attempt at producing cams or, when experimenting, for speedily varying angles and lifts-particularly if the camshaft is designed for flat cams clamped to a shoulder by a nut, or if the cams have bosses for securing by grubscrews or crosspins.

A hand-filing jig, as at ***A,*** can be made from two pieces of flat steel plate, case-hardened, or hardened and tempered, depending on whether mild steel or cast steel is used. If possible, one piece should be the width of the cam, and the two pieces should be dowelled together. The centre hole can be drilled and bored, either for a tight-fitting bolt or the cam boss; and in the plate which is cam width, the hole should be opened to cam blank diameter. If the cam is to have a boss, it is advisable to arrange for this to be smaller than the base circle, so that a shoulder is left; and a recessed washer, as shown, may be needed. With surplus hacksawed from the two plates, they can be faced in the independent chuck to give base circle diameter-then hardened.



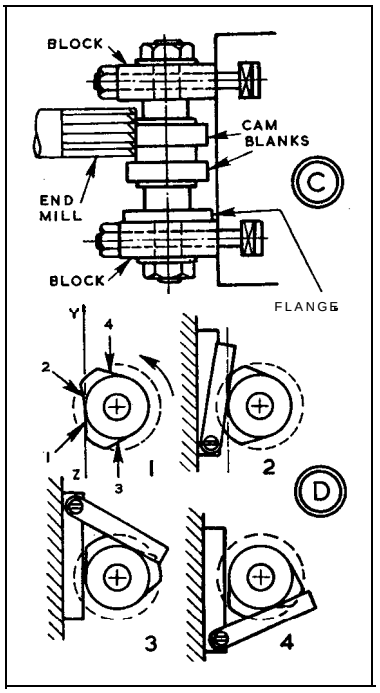
A cam blank in the jig (and this held in the vice) can be sawn and filed down to one flat, then turned through the opening angle for sawing and filing along the other flat. Following which, all material between can be similarly removed. Angle markings can be placed on the jig, as at V and ***W,*** then a single mark on the cam blank moved from one to the other will give the required opening angle X.

Such a jig can be used in the independent chuck for turning a cam, setting it round in stages to nibble material from the base circle. Then to finish the cam, a hand mandrel can be fitted tightly in the bore; and with the jig in a vice, the cam can be twisted round to finish the base circle by smooth filing.

Another method

Alternatively, to employ this turning principle without a jig, a cam blank can be mounted on a fixed pin on an angleplate on the faceplate, for machining the flats which give the opening angle-and nibbling away the material between almost down to the base circle. Then to finish the base circle accurately by filing, two thick washers can be turned and case-hardened, and bolted one each side of the cam.

To mill a cam, the blank can be attached to a mounting plate, as at ***B,*** and the plate set up on the cross-slide of the lathe. Then an endmill or facemill run in the chuck will produce the flats; and the blank can be turned for removing surplus metal between them. To set the blank accurately in the second position, the plate can have marks, as at ***A;*** or alternatively, after milling the first flat, a gauge (set to angle from a protractor) can be presented to it and to the edge of the mounting plate, to locate the blank for the second flat. Finally, to finish the base circle, the cam can be held between two thick washers for filing.



Compactness demanding cams and shaft to be integral, endmilling can be effectively employed-with the shaft finally turned afterwards. Thus, a turned diameter and a nut each end provided for setting the shaft in blocks on the vertical slide, as at C. If desired, a flange can be marked with four positions giving the opening angles of the cams.

Without a flange, however, four essential settings can be obtained, as at D-three with a gauge to the face of the chuck. Flat 1, the closing flank of the exhaust cam, can be milled at setting 1, along line Y-Z. For flat 2, the opening flank of the inlet cam, a gauge provides setting 2. For flat 3, the opening flank of the exhaust cam, the gauge gives setting 3; and for flat 4, the closing flank of the inlet cam, the gauge gives setting 4.