

# Holes on pitch circles



**W**HERE several holes are to be arranged on a circle in a component, it is both convenient and logical to locate them by giving the dimension of the pitch circle and the number of holes equally spaced, or their angular spacing in degrees. Usually, the holes are for bolts or studs for securing another part; and once their size has been decided, it is a simple matter to make the pitch

## By GEOMETER

circle of a size to allow clearance over the corners of bolt heads or nuts at the nearest "unit" dimension. There need be no calculation—but merely drawing to size, or scaling, and setting off the angles by protractor.

This is of the utmost convenience. It is also logical except, perhaps, in one case; for the design intention is obvious, and the working drawing is kept free from many "odd" dimensions. The exception is when there are four equally spaced holes, when it may be convenient, by adjusting the dimensions outwards, to position the hole centres linearly either side of centre lines to the nearest round fraction of an inch.

In production, too, methods similar to those common in draughting can often be employed. That is, pitch circles can be scribed, and many hole centres found by dividing, then centre-punched and drilled. But in cases where great precision is essential it is necessary to have the linear equivalents of the circular spacings, to permit holes to be jig-bored or buttons located for setting up on a lathe.

Something of an exception can be made in the case of four holes now on a pitch circle, if their locations are to be obtained by jig-boring or, on the same principle, using a vertical slide with accurate feed and cross slide feed. A plate or gauge with 45 deg. angle for location, as at A, can be mounted and one edge trued by indicator checks parallel to a slide. With the component located and clamped, the hole centres are on vertical and horizontal lines; and in reference to readings taken at the centre lines, it is only necessary to

move away to the extent of the radius of the pitch circle.

If the component is turned through 45 deg. so the hole centres lie on two horizontal and vertical lines, as at B, the spacing must be calculated; and to arrive at dimension X or XI from the centre, the radius is multiplied by 0.707107.

Where buttons are used, twice X or XI plus the diameter of a button gives the dimensions for checking by micrometer. For boring eight holes, the easiest method is to locate four from radius dimensions, as at A, and the remaining four through simple calculations, as at B.

The principle can be applied in the case of three and six holes, as at C. With three holes, a radius dimension locates the one vertically above the centre, and locations for the other two can be obtained by calculating Y and Z. Dimension Y is half the radius; while for Z, the radius is multiplied by 0.866025. Six holes on a pitch circle consist of two such basic three-hole spacings, one the other way up.

When buttons are to be set to spacings on a pitch circle, it is con-

venient to employ a locating plate in thin material, as at D, the diameter being equal to that of the pitch circle minus the diameter of a button. With the locating plate clamped, buttons can be kept up to it and set by checking over or between pairs of them. For removal, by careful twisting the plate can be scalloped at the edge and drilled for a pin spanner.

Spacing of pairs of buttons may be facilitated by means of a holder for an end gauge, or through a clamp to hold them while they are fixed, as at E; and accurate drilling on small pitch circles may be done with a jig, as at F, with the diameters of the bushes arranged for them to lie round a centre and in a ring, with their centres on the pitch circle. □

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