DOUBLE-WEB CRANKSHAFTS

By GEOMETER

WHILE the double-web or full crankshaft is a more complicated component than the single-web type, it admits of greater choice in engine layout both for essential components and auxiliary drives.

Thus, for a steam-engine, eccentrics for valve-gear and water-pump operation can be on the side of the crankshaft, away from the flywheel; and similarly for a four-stroke internal combustion engine there is freedom to set out the valve gear in several different ways, according to what may be considered desirable or expedient.

For these advantages, the penalties are more work in producing the crankshaft; material retained in the soft conditron-since it is impossible to harden the crankshaft, and split big-ends to the connecting rods-unless a complicated built-up crankshaft is used. In most instances the choice for a simple single-cylinder or multi-cylinder engine in model sizes is a machined-from-the solid or permanently built-up crankshaft of steel, and connecting rods with split big-ends of brass, bronze, or white metal.

Types of crankshaft

Diagrams A, ***B*** and C show types of crankshaft employed in single and twin-cylinder engines. That at A may be used in a single-cylinder double-acting steam-engine, or in a single-cylinder internal combustion engine-when it usually has balance weights. That at ***B*** is employed in flat twin or horizontally opposed internal combustion engines, where the cylinders fire alternately. The crankshaft at C is the type required for twin-cylinder double-acting steam-engines where the crankpins are at 90 deg.

At ***D*** appear end views of the crankshafts, and it can be seen that types ***A*** and ***B*** can if desired be made from solid rectangular material, but that type C would require a square section. Hence, it might be decided that while types ***A*** and ***B*** could be made from the solid without too much labour, type C would be better built up.

A crankshaft for a vertical twin-cylinder single-acting steam-engine can be made from solid rectangular material as at ***E.*** This crankshaft is similar to that at ***B*** for the flat twin internal combustion engine, but the crankpins are further apart and the centre web is at an angle instead of being straight.

The method of preparation for either of these crankshafts (and for single-cylinder types) is as shown. The steel bar is cut and faced to overall length-plus. On a surface plate, the ends are marked with throw centres for these to be centre-drilled. Surplus material is cut away by drilling and hacksawing, then the crankshaft is rough-machined-advisedly gripping one end in the independent chuck for a firmer drive and more rigid support than can be obtained between centres. Finally, of course, the crankshaft is finished between centres and the throw "plates" sawn off for the ends to be turned.

For built-up crankshafts, over-width flat or rectangular-section material is used for webs, and over-size round material for crankpins and mainshafts. For machining the crankpin of a single-cylinder crankshaft, as is usually necessary, the crankpin rod can be as long as the mainshaft and centred as at F. After the brazing or welding, the mainshaft is sawn away between the webs and the crankpin machined. Then the surplus material is cut off outside the webs and the mainshaft turned.

When there is more than one crankpin, plates must be fixed to the mainshaft, either brazed, welded or clamped, on the principle at ***E.*** On occasion however, with careful brazing crankpins need only be cleaned up with emerycloth.

For brazed crankshafts, crankpins and mainshaft can be parallel and the webs slightly countersunk; but for welding,. a stepped crankpin is advisable with the ends chamfered and the webs deeply countersunk. Penetration as shown should be aimed at in welding.

Webs may be extended to form balance weights and should be a good fit for crankpin and mainshaft material. Boring should be with them clamped on a faceplate, or sub-faceplate, with a plug locating the first hole, as at G. ■