Beginner's Workshop

TWIN-CYLINDER ENGINE TYPES

By *Geometer*

AFTER single-cylinder and multi-cylinder in-line internal combustion engines, the twin-cylinder in its various forms is, perhaps, the most popular type, possessing the advantage of a smoother turning movement than a single-cylinder, yet with fewer parts and less complication than four and six cylinder engines.

The four common types of twin-cylinder engines are the vertical twin four-stroke ***A,*** the vertical twin two-stroke B, the flat-twin horizontally opposed four-stroke C and the V-twin four-stroke D-this last somewhat less popular in recent years than formerly in the motor-cycle world. Any may, of course, be encountered full scale and all make attractive models.

In the vertical twin four-stroke ***A,*** the two crankpins are in line, the crankshaft has two bearings, and the centre " web " is generally circular as a flywheel, damping vibration to promote smooth running On the four-stroke principle, two revolutions of the crankshaft are required for a complete cycle; consequently, in this engine the cylinders fire alternately, and there is a power stroke every revolution. Mechanical balance, however, is little, if any, better than that of a single-cylinder engine.

In the vertical twin two-stroke ***B,*** the cylinders are in line, but the crankpins are at 180 deg A little reflection indicates the reason for this arrangement If the crankshaft had the crankpins in line, as a ***A*** (but with separate crank chambers), then both cylinders would fire together-as the engine is a two-stroke, which cycle produces a firing stroke every revolution.

If, again, with the crankpins in line, one cylinder was situated so as to make a horizontally-opposed engine, then the balance would still be no better than that of a single cylinder. The actual layout thus achieves even firing (a power stroke every half revolution, the same as a four-cylinder four-stroke) with the best balance.

In the horizontally-opposed four-stroke, as at C, similar considerations apply. The cylinders still fire alternately, providing a firing stroke every revolution, and mechanical balance is very good-better, perhaps, than that of the twin two-stroke, as the opposing masses of pistons and connecting rods are more nearly in line, and there is minmum twist on the crankshaft. Using this crankshaft with the vertical twin cylinders at ***A,*** even firing could not be obtained so what might be gained in balance could be lost in uneven turning movement.

The V-twin four-stroke engine, as at ***D,*** is a complete compromise, the justification for which is probably that it is compact and of a shape fitting well in a motor-cycle frame. The inclination of the cylinders, shown as 60 deg., may be more or less than that angle, since it is decided more from simple layout than from theories concerning even firing or balance. The two connecting rods are attached to the one crankpin-an arrangement slightly improving balance over that of a single cylinder, but not equalling that of a horizontally opposed twin.

Firing occurs as follows. Regarding the left cylinder as No 1 and at the firing position, the crankshaft makes one revolution to the original position, and must then pass through the cylinder angle (60 deg.) for the right cylinder, No 2 to fire. Following this, the crankshaft turns one revolution less 60 deg., which brings it back to the position at ***D,*** where No 1 fires. Firing is thus irregular according to the angle of the cylinders.

Ignition on a twin-cylinder can be provided by a single contact breaker and distributor, or by two contact breakers and coils, as is sometimes the case on twin two-stroke engines.

Using one coil, the contact breaker cam has two lifts, and the cam and distributor run at crankshaft speed on two-stroke engines, and at camshaft speed on four-stroke engines. For engines ***A, B*** and C, the two lifts are opposite, as at E, on line X-Xl; but for the V-twin ***D*** the lifts, as at F, must be at an angle to line X2-X3, equal to half the cylinder angle ❑