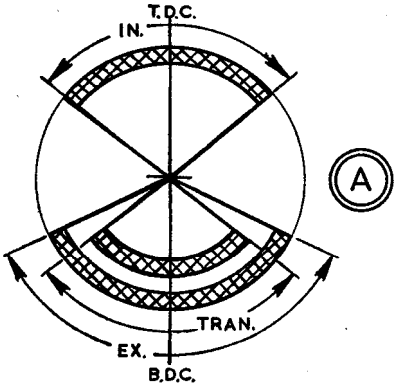
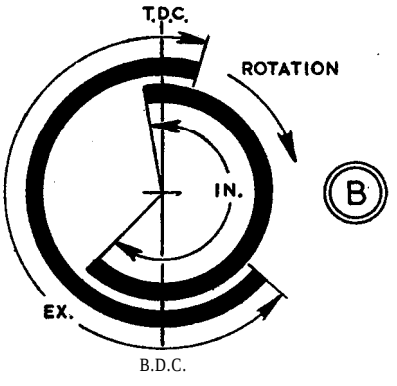
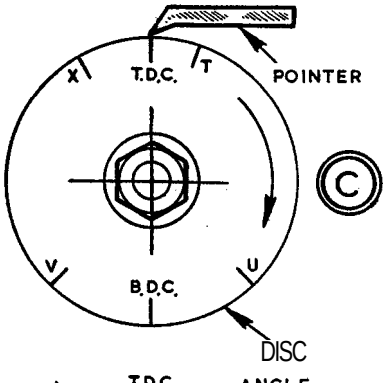
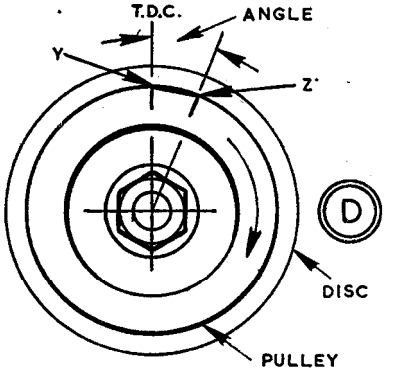
By GEOMETER

PORT and VALVE TIMING









WHETHER an internal combustion engine is model or " full scale," its running is controlled by the sequence of port openings (if it is a two-stroke) or by valve events if a four-stroke. For timing, these port and valve events are always given in relation to two fixed points in piston movement-when it is farthest into the cylinder at top dead centre, and when it is farthest out of the cylinder at bottom dead centre.

In the case of a simple two-stroke engine timing only really concerns the designer, tuner or student. It is of little interest to a mechanic, since it results automatically from assembling the engine.

In the case of a four-stroke engine of poppet valve type timing is necessarily of interest to the mechanic, since it is essential for it to be correct on assembly? and there are a number of possibilities. It may be known from a handbook or data, or may be checked before the engine is dismantled.

It may derive from a single camshaft, as on most cars and some motor cycles, or it may result from two camshafts operating inlet and exhaust valves. For a mechanic dismantling, it is desirable to know the number of camshafts and timing -the complete timing if there are two camshafts.

Examples of four-stroke timing are:

I Inlet opens at t.d.c.; closes 45 deg. after b.d.c. Exhaust opens 50 deg. before b.d.c. ; closes 10 deg. after t.d.c. With a single camshaft, setting of inlet controls the timing; with two camshafts, separate setting required for the exhaust.

2 Inlet opens 10 deg. before t.d.c.; closes 50 deg. after b.d.c. Exhaust opens 50 deg. before b.d.c.; closes 10 deg. after t.d.c. Timing is equally overlapped at t.d.c., and with a single camshaft can be easily checked against piston movement.

3 Inlet opens 5 deg. before t.d.c.; closes 45 deg. after b.d.c. Exhaust opens 50 deg. before b.d.c.; closes 15 deg. after t.d.c. Timing is not equally overlapped, nor does inlet open at t.d.c., so there could be confusion with *1* and 2, if not known.

In some instances timing for 3 may be obtained by setting the inlet valve with a wider clearance to open at t.d.c. Almost always, the same could be done for the exhaust-i.e. chose the t.d.c., open the adjustments until the valves are just seating, then turn the engine and check clearances with feeler gauges before dismantling. Then, on assembly, verification is possible.

Points of valve opening and closing may also be given or obtained as distances from t.d.c. of the piston which can be measured in the cylinder. Again, motor-cycle engines with internal flywheels can have dot marks made on these against a reference dot in the crankcase.

A cardboard disc on the crankshaft, a fixed pointer on case, and observing where the piston of a simple two-stroke engine uncovers and covers the ports, a diagram is obtained as ***A***, the timing equally overlapped, and the exhaust enclosing a larger angle than transfer owing to greater depth of ports,

Representation of four-stroke timing is as ***B,*** where inlet-exhaust timing is not equally overlapped at t.d.c.-case 3. With the cardboard disc and pointer, this timing is obtained as C. Point of inlet opening is ***T,*** point of closing U. Point of exhaust opening is V, point of closing X, t.d.c. and b.d.c. being marked. Such a disc can also be set out with a protractor (draughtman's type), or the angles obtained can be measured.

For checking car timing, the inlet opening angle can be marked on a disc, as D. The crankshaft pulley diameter is marked and the angle obtained as a straight line between Y, Z. Dividers transfer this to the actual pulley, nicking with a tile to check to a pointer,