

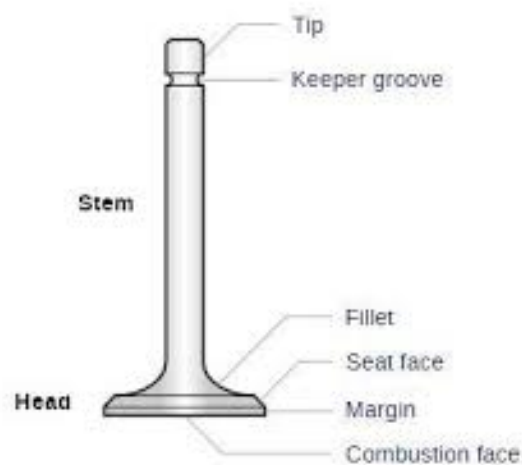
AI 3401 TRACTORS AND ENGINE SYSTEMS

UNIT II NOTES



VALVE:

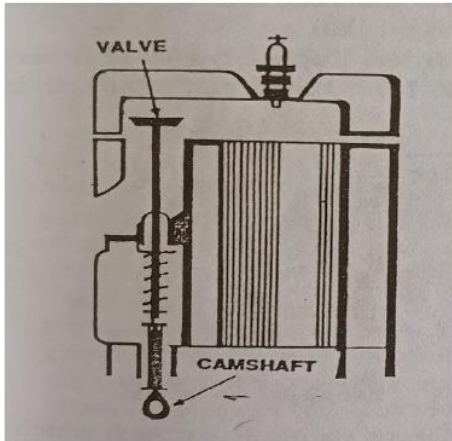
A valve is a small mechanical device, used for opening and closing the passage leading to the engine cylinder. Inlet valve of an internal combustion engine allows air or air-fuel mixture to go into the combustion chamber. The exhaust valve allows burnt gases to go out of the engine cylinder. Each valve is opened or closed once during each cycle. A strong spring with the help of retainer and a key holds the valve tightly against the seat and thus prevents leakage on the compression and power stroke. The common face and seat angle of valve is 45° but 30° angle is also used for intake valves.

**Poppet valve**

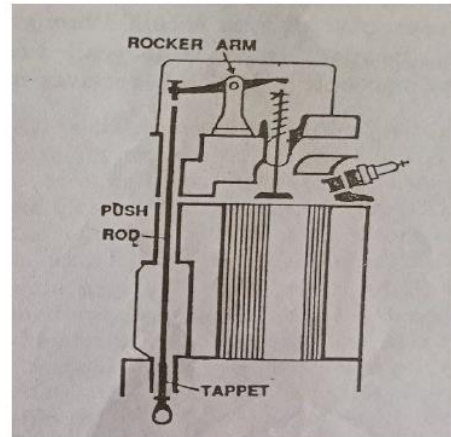
The most common type of valve is called poppet valve. The arrangement of the valve on the engine is of two types:

1. L-head type and
2. Over-head type

L-head' arrangement is used quite extensively on tractor engines and automobile engines. In 'Overhead' arrangement, the valve stem is surrounded by a removable guide and a spring which holds the valve tight in its seat.



L- head valve



Overhead valve

Valve head: It is made of special alloy which can withstand high temperature and hammering action due to expanding gases.

Valve stem: It is a round steel rod attached with the valve head.

Valve seat: It is the place in the cylinder head where the valve head sits well. It may be made in cylinder head or in the engine block. Sometimes removable valve seats are also used.

Valve stem guide: It is a small guide, which fits into the cylinder block. It is usually made of cast iron. In some cases, a reamed hole in the block also serves as valve guide.

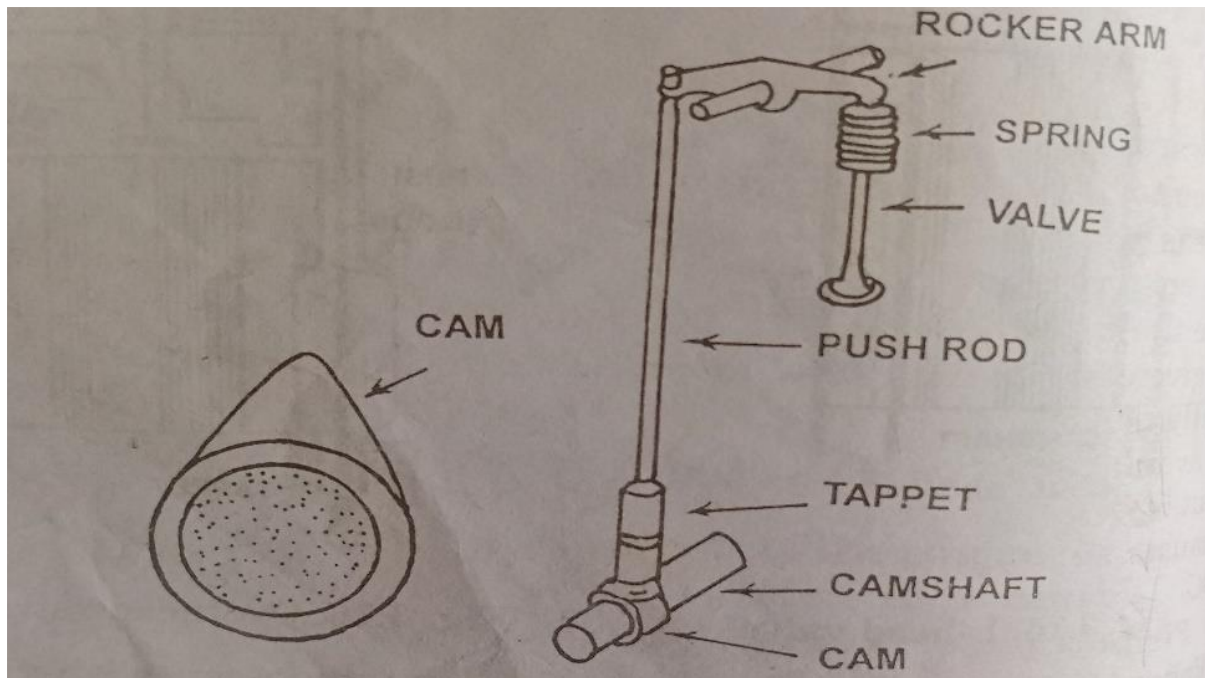
Valve operating mechanism:

Valve operating mechanism consists of several components such as:

- (a) Crankshaft gear
- (b) Cam gear
- (c) Camshaft
- (d) Push rod
- (e) Tappet and
- (f) Rocker arm

The crankshaft gear operates the cam gear which is fixed at one end of the camshaft. Consequently, camshaft rotates and moves the tappet, which pushes the push rod in proper time. Thus push rod opens or closes the valves at predetermined intervals. The camshaft gear is double the size of the crankshaft gear, so there is one

revolution of the camshaft for every two revolutions of the crankshaft in case of four stroke engine.



Position of tappet and rocker arm

Crankshaft gear: A gear fixed at the end of the crankshaft which meshes with the gear of the camshaft is called crankshaft gear.

Cam gear: A gear fixed at the end of the camshaft to mesh with the crankshaft gear is called cam gear.

Tappet: Tappet is also called valve lifter. Tappet raises or lowers the valves. It receives motion from the cams, mounted on the camshaft. It opens or closes the valves at proper time. It is usually made of hardened steel.

Valve lifter guide: It guides the tappet in motion.

Rocker arm: It is an arm used to change upward motion of push rod to downward motion for opening an engine valve. It is a small rod, one end of which touches the end of the valve stem and the other end touches the upper end of the tappet rod.

Tappet clearance: It is the clearance between rocker arm and valve stem to enable the valves to sit properly.

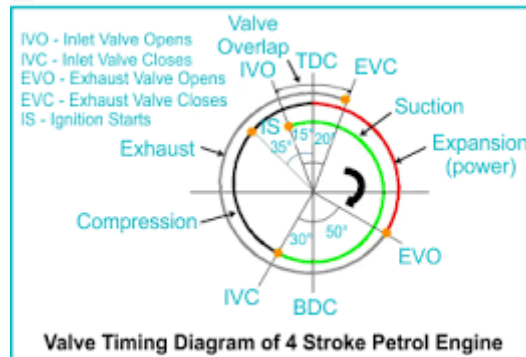
VALVE TIMING DIAGRAM:

A valve timing diagram is a diagram of crank rotation on which the time of opening closing of inlet valve, exhaust valve are shown.

Valve timing mechanism is concerned with relative closing and opening of valves and their duration with respect to the cylinder position and the degree of crankshaft rotation.

Top dead centre (TDC) is the instant when a piston is at the top of its stroke i.e. it is on the

point of changing from upward to downward motion. Bottom dead centre (BDC) is the instant when a piston is at the bottom of its stroke i.e. it is on the point of changing from downward to upward motion.



Valve timing diagram of four stroke engine

Theoretically the intake valve should open on top dead centre (TDC) and close at bottom dead centre (BDC), whereas the exhaust valve should open on bottom dead centre and close on top dead centre, but in actual practice these angles differ. Valve timing is a function of engine speed. The best valve timing for any given engine can be determined only by actual test, as it depends greatly on the design of the intake and exhaust passage. For most of the average tractor engines of four stroke cycle, the inlet valve opens about 5° before TDC and closes at about 30° after BDC, the exhaust valve opens about 40° before BDC and closes at about 5° after TDC.