GOVERNOR & FLYWHEEL

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Speed Control

- In all engines the variation in the speed occurs due to the variation in the load and the speed control is achieved through governing of the engines.

- It is necessary to control the variation of speed within certain desired limits. The desired limits depend upon the types of heat engines and the nature of applications.

Speed Control

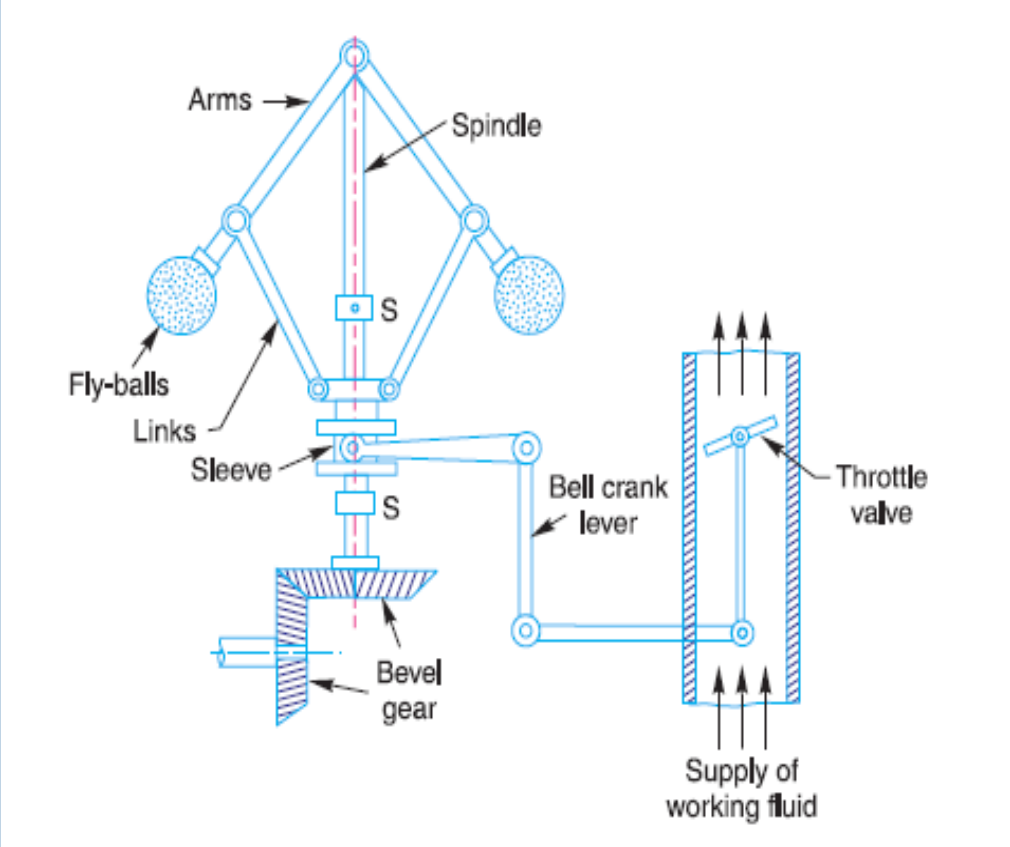
- For the same power, an increase in load on engine causes a decrease in engine speed and decrease in load causes increase in speed.
- To maintain constant speed, all engines are provided with the device known as governor, the function of which is to regulate the variation of speed due to the change in load.

Purpose of Governor

- Purpose of governor is to keep the engine running at a desired speed regardless of the changes in the load carried by engine.

Speed Regulation by Governor

- The speed regulation by governor is done by controlling flow of steam in steam engine or by controlling the amount of fuel admitted in I.C. engines.
- The control is achieved by the mechanism operated by the action of centrifugal force of rotating masses of the centrifugal type governor.



Hit and Miss Governing:

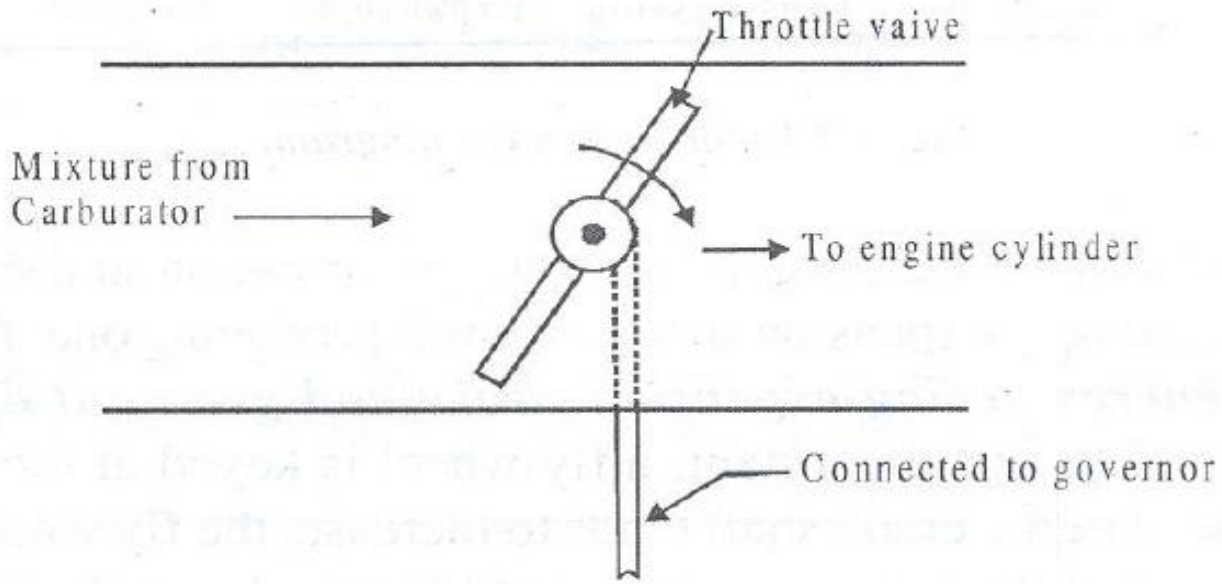
- In this type of governing, the action of the governor causes the fuel inlet valve to remain closed during a cycle so that no fuel is admitted, the engine will thus perform idle cycle.
- This method will slightly lower the engine efficiency by increasing the proportion of idle strokes to working strokes. It also has disadvantage of producing a more uneven turning moment on the shaft.
- The hit and miss method of governing is in common use in small gas engines and is actually quantity governing.
- In small, light oil engines, the hit and miss mechanism operates on the exhaust valve and prevents its opening when the speed is too high. The burnt gases are thus retained in the cylinder and are alternately compressed and expanded until the speed is reduced.
- Other methods of hit and miss governing for small engines are by either
- (i) holding the exhaust valve open so that no suction may occur or
- (ii) by failing to open the inlet valve.

Quantity Governing

- This method varies the quantity of mixture (air/fuel) or charge drawn into the cylinder to suit the load. It does not affect the quality (air/fuel ratio) of the mixture or charge. This is sometimes done by throttling the mixture before it enters the cylinder.
- The movement of the throttle valve being regulated by the lift of the centrifugal governor. Another method of quantity governing used in large gas engines is by varying the lift of the inlet valve and thus reducing the quantity of mixture entering the cylinder.
- Quantity governing is preferred for petrol and large gas engines. In petrol engines a throttle valve is placed after the carburettor.
- In gas engines, this type of governing is done by:
  - (i) varying the lift of inlet valve
  - (ii) keeping the valve in the pipe carrying the mixture to the cylinder.

Quantity Governing

QUANTITY GOVERNING



Quality Governing :

- In this method of governing, the strength of the mixture (air/fuel ratio) is altered by the action of the centrifugal governor, thus varying the quality of the mixture. This is done by regulating the amount of fuel entering the cylinder, the air supply remaining constant.'
- This method of governing is normally used in all heavy oil engines using pure air compression.

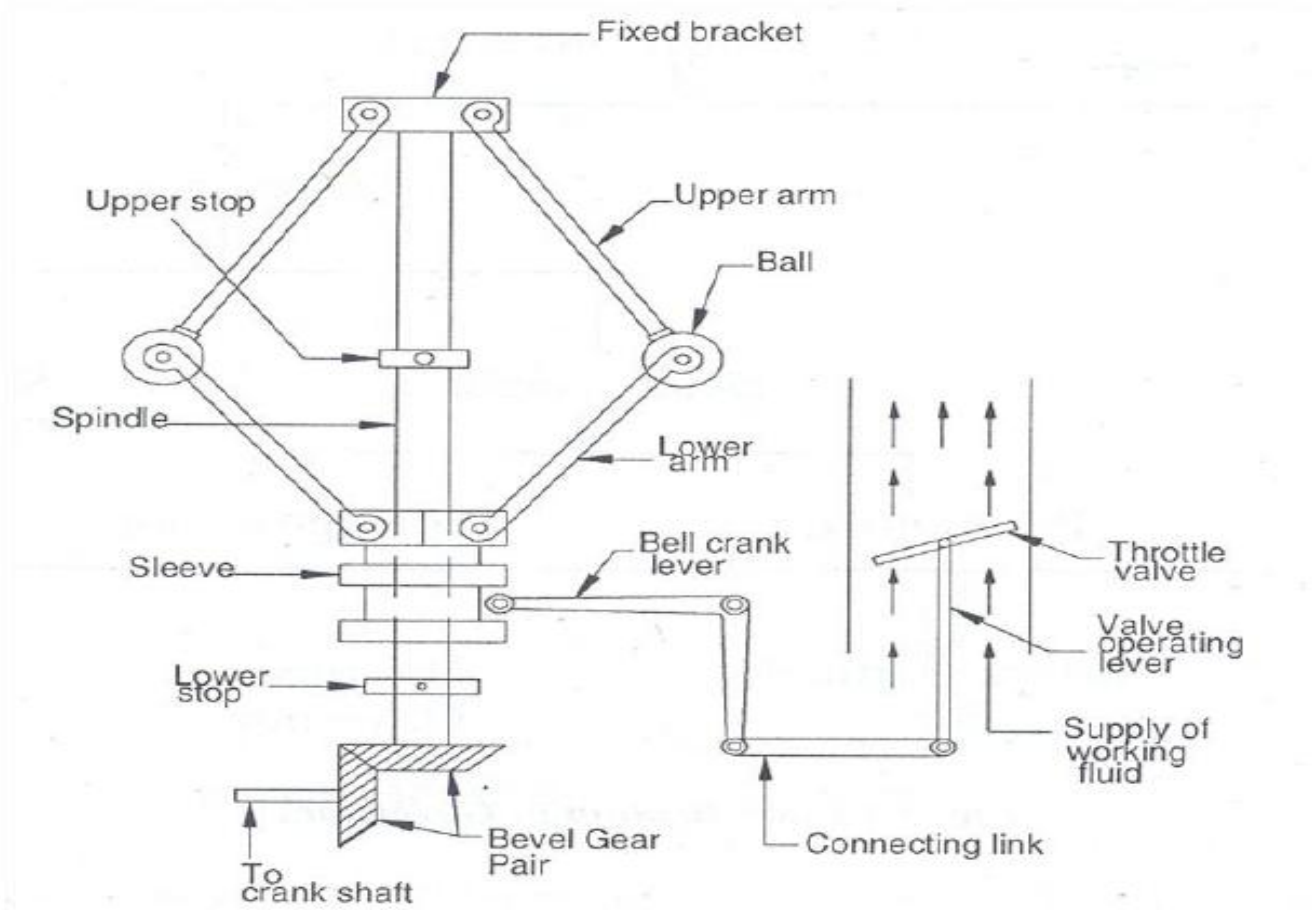
- The amount of fuel entering the cylinder is varied by action of governor which may very the stroke of the oil pump, or it may by pass part of fuel back to the oil tank or it may delay the closing of the suction valve of the fuel pump. These methods will cause a variation in the point of cut-off.
- The limitations of both quality and quantity governing can be eliminated by combining these two methods known as combination methods.
- Quality governing is used when the load is nearer to the normal load and quantity governing is used when load is much less.

By Changing Spark Timing :

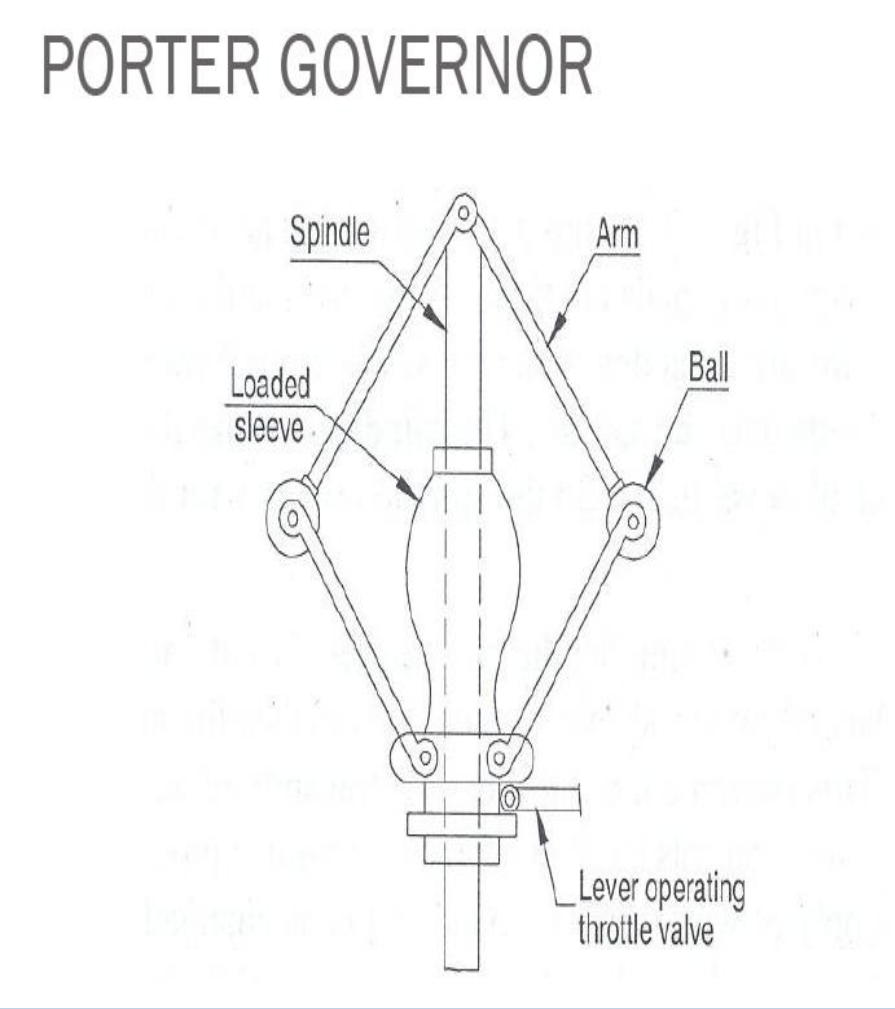
- For S. I. engines, the speed can also be controlled by changing the ignition timing. This method is only used for small engines where fuel economy is not very essential.

Watt Governor

WATT GOVERNOR

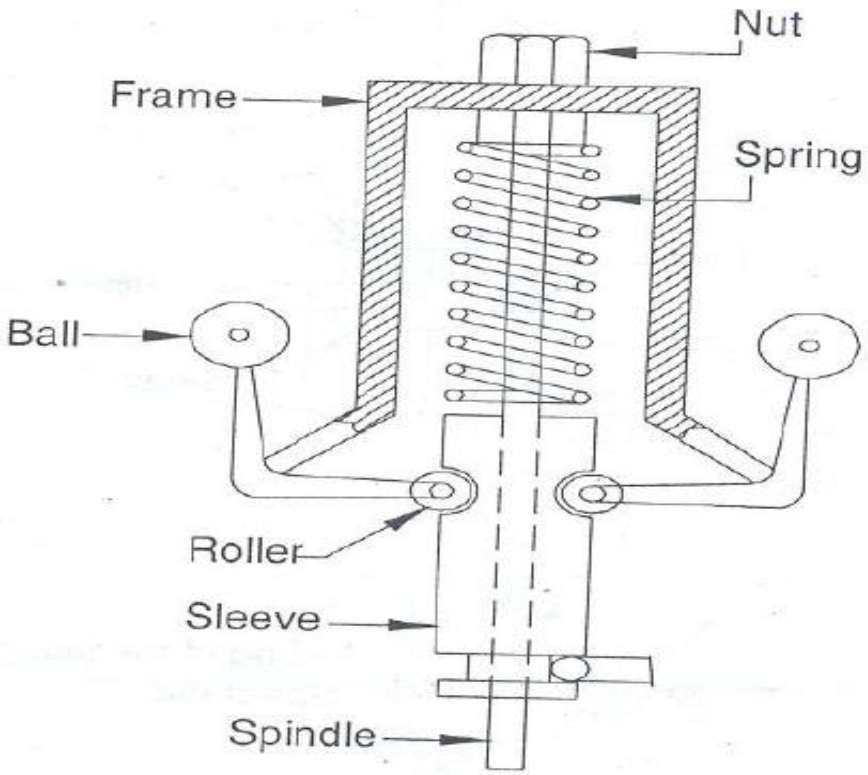


Porter Governor

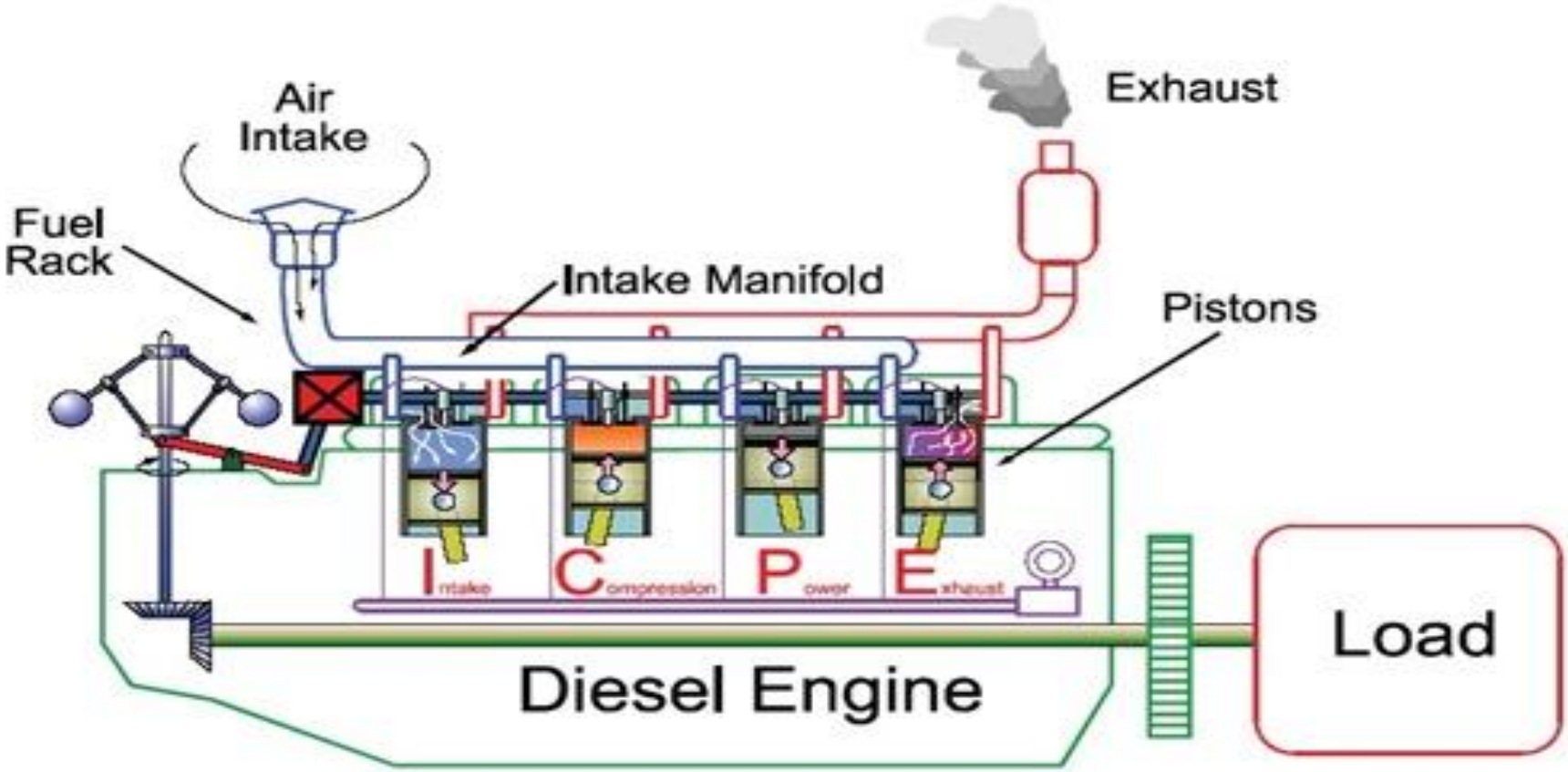


Hartnell Governor

HARTNELL GOVERNOR



Governor on Diesel Engine

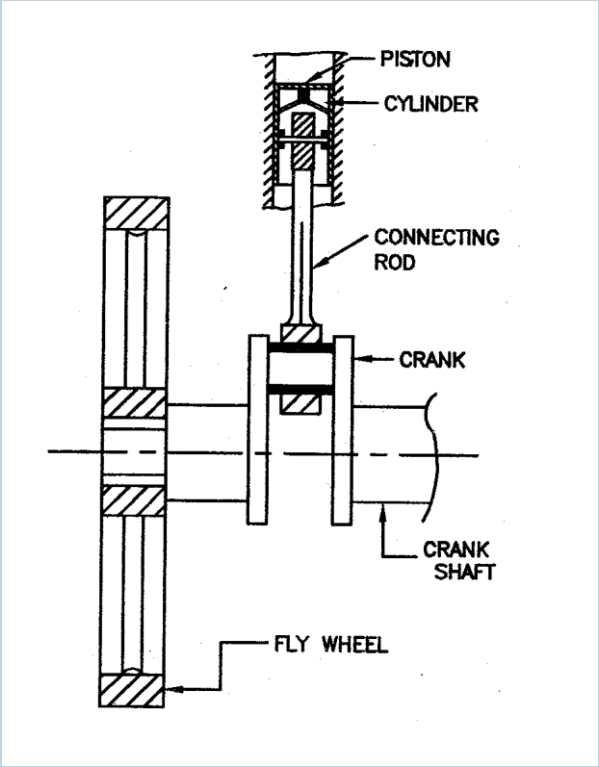


Speed Governor Installed on Four Stroke Diesel Engine

Flywheel

- In four stroke cycle I.C. engine, suction, compression and exhaust stroke are power consuming stokes while only expansion stroke is power producing stroke.

- Fly wheel stores the excess energy during expansion stroke and gives out during remaining stokes. To maintain the speed constant, a flywheel is keyed at the end of the crank shaft .

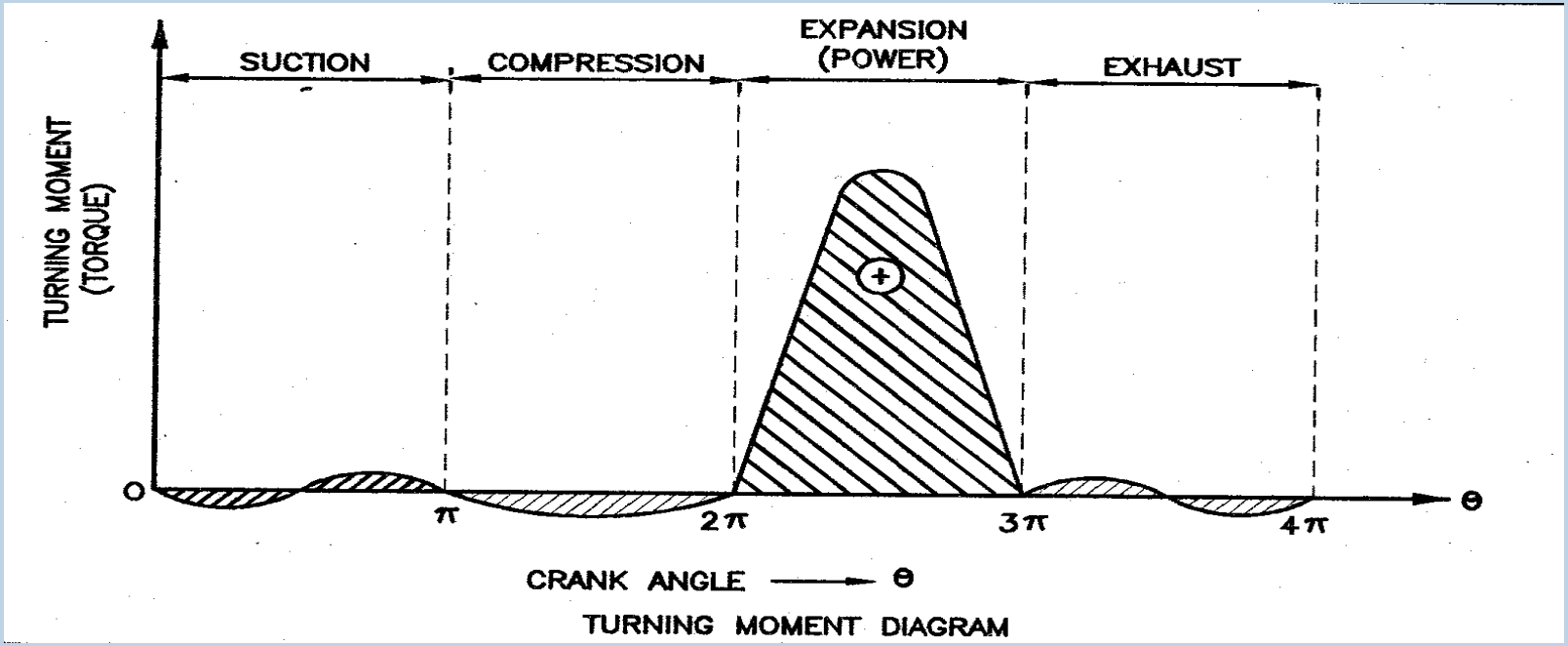


Flywheel

- The fly wheel is in the form of disc or wheel made generally of cast iron and its mass depends upon the nature of variation of the pressure during the cycle in the cylinder. Lighter fly wheels are needed in double acting steam engines, two stroke cycle engines and multi cylinder engines than in four stroke engines.

A flywheel stores energy when the supply is in excess and releases energy when energy is in deficit.

Turning Moment Diagram of Flywheel



- The object of both fly wheel and governor is similar - to control speed of the crank shaft but there is fundamental difference between them. The variation in pressure during cycle is controlled by fly wheel, while the variation in the speed due to variation of load is controlled by a governor.

Comparision Between Governor and Flywheel

Governor	Flywheel
(1) The function of governor is to maintain the speed of an engine within prescribed limits for varying load conditions.	(1) The function of fly wheel is to control variation of speed during the cycle due to fluctuation of torque. It does not control Speed variation caused by the varying load.
(2) It automatically controls the supply of working fuel to the engine with varying load conditions.	(2) It absorbs excess energy developed during power stroke and releases it to the crank shaft during the other strokes.
(3) It maintains constant speed of the Engine.	(3) It simply reduces the cyclic fluctuation in the speed.

EXERCISES

- Explain briefly why is it necessary to have speed control in heat engines ?
- What is governor ? What are the various types of governors ? Explain briefly Watt governor with a neat sketch.
- State the methods of governing steam engines and describe briefly one.
- State the various methods of governing. I.C. engines and describe any one in brief.
- Which method of governing is preferred tor (i) Diesel engine (ii) Petrol engine, why ?
- What is fly wheel ? How it works ? How governor differs from fly. wheel ?
- What is the purpose of governer ? With a neat sketch describe the working of a Hartnell Governer.
- With a neat sketch describe the operation of Watt governer.
- What is the function of governer ? Classify the governing methods used in I.C. En-gines and describe quantity method of Governing.
- Explain quality governing, quantity governing and hit and miss method of governing.
- What is function of Governor. What are different methods of I.C. Engines gov-erning ? Describe Suitable method for governing S.I. Engine.