TOPIC :

FUELING SYSTEMS OF IC ENGINE

(PART I)

LECTURE (03 + 04)

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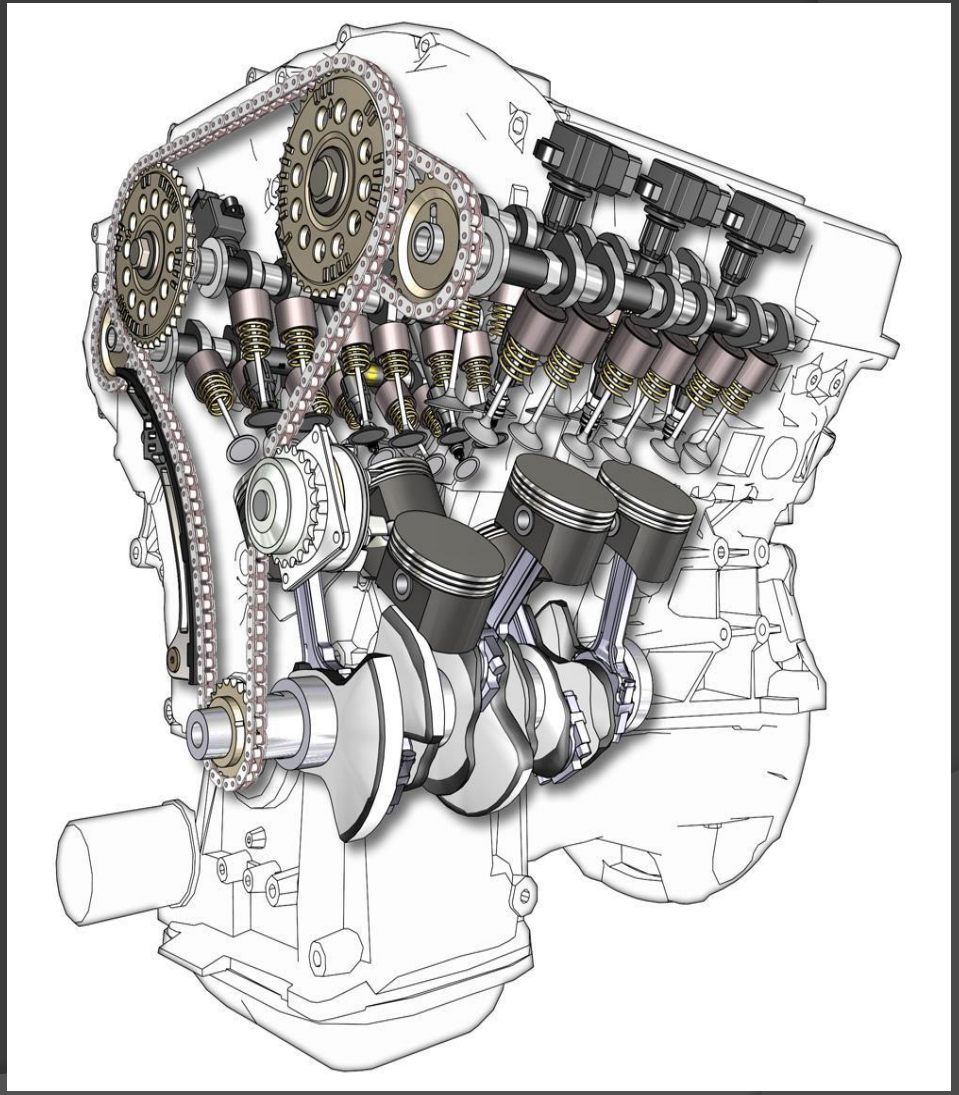
What is Engine?

- Engine is a machine for converting energy into motion or mechanical work. The energy is usually supplied in the form of a chemical fuel, such as oil or gasoline, steam, or electricity, and the mechanical work is most commonly delivered in the form of rotary motion of a shaft.



What is fuel system?

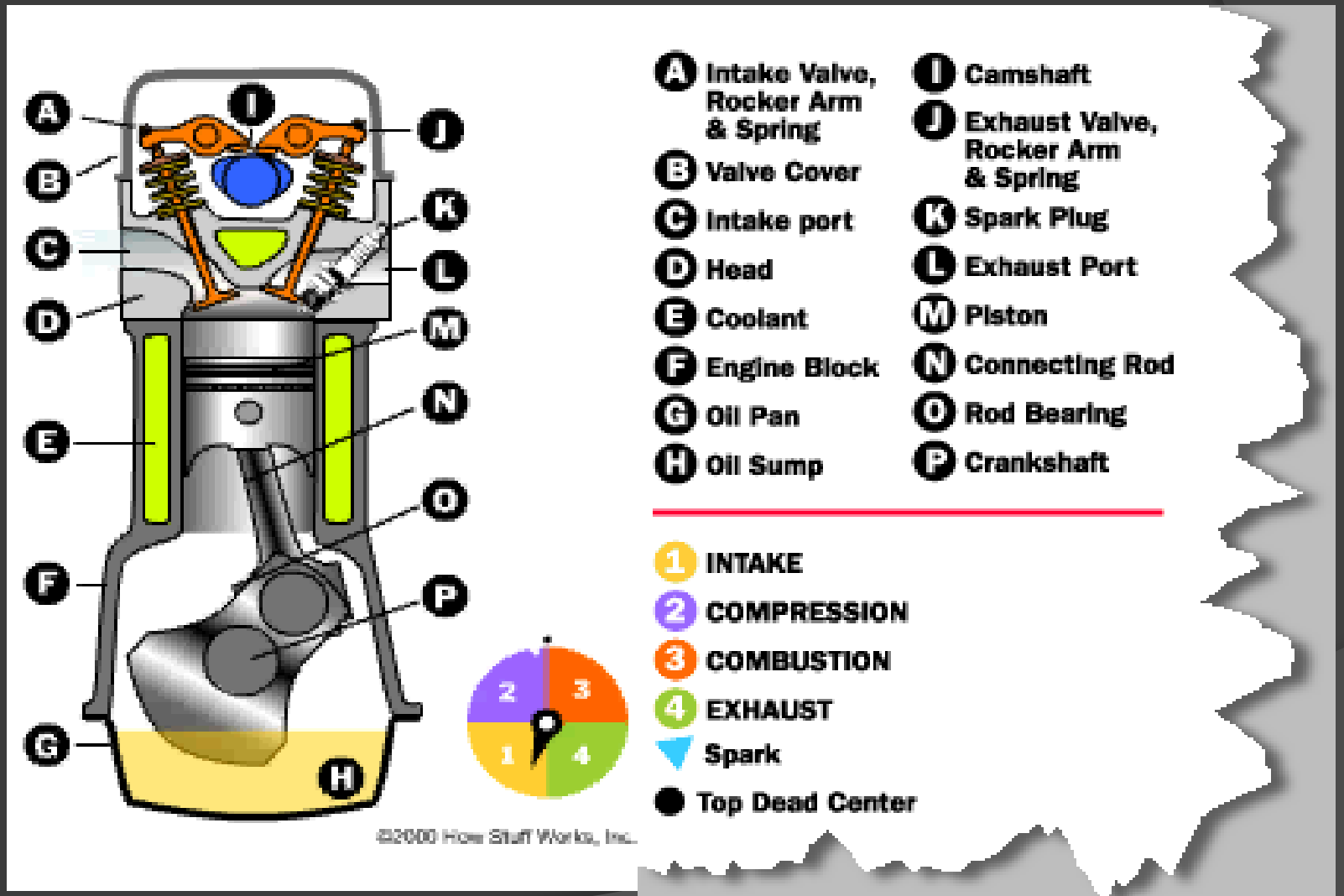
- The function of the fuel system is to store and supply fuel to the cylinder chamber where it can be mixed with air, vaporized, and burned to produce energy. The fuel, which can be either gasoline or diesel is stored in a fuel tank. A fuel pump draws the fuel from the tank through fuel lines and delivers it through a fuel filter to either a carburetor or fuel injector, then delivered to the cylinder chamber for combustion.

FUEL TANK

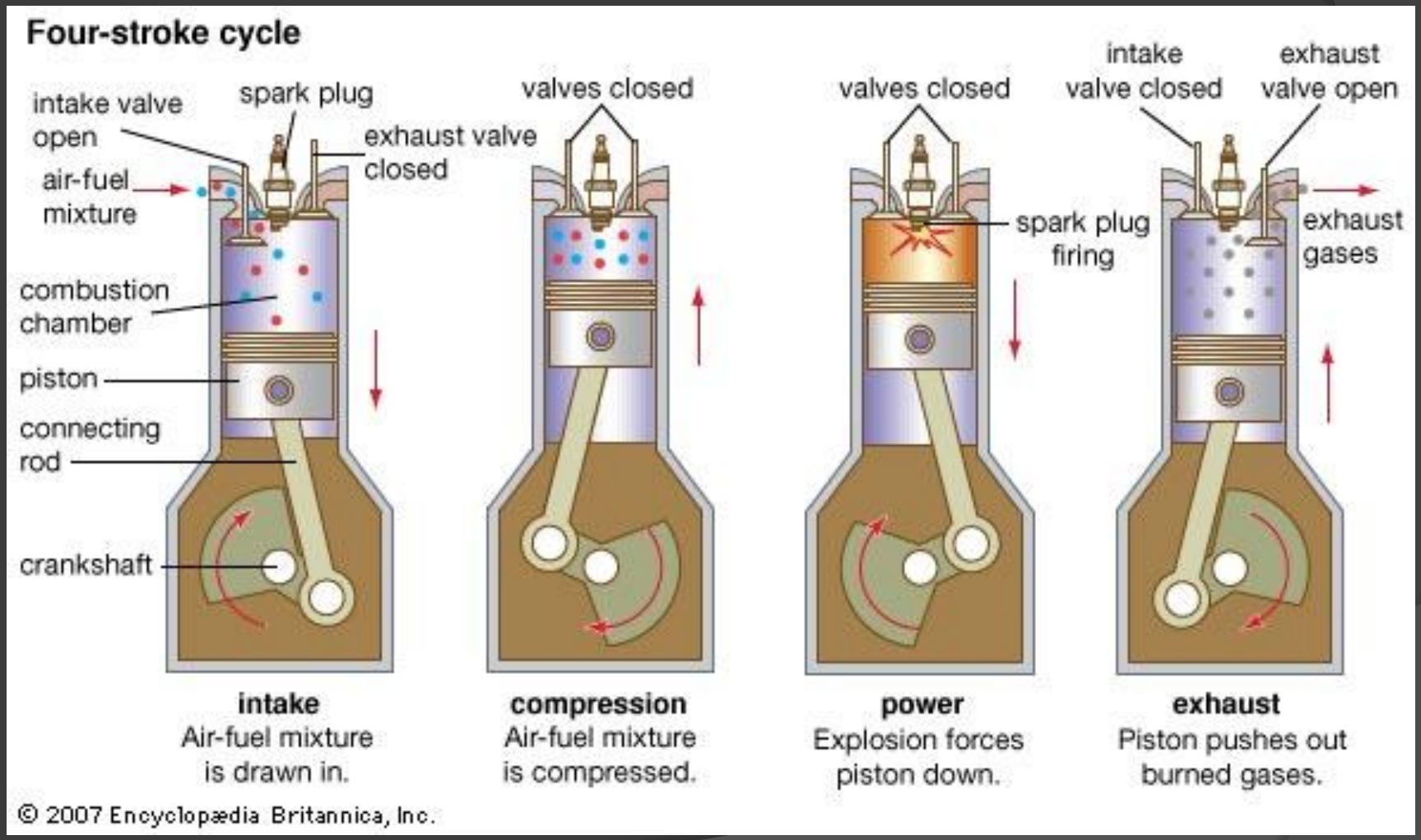
Fuel supply system of an internal-combustion engine. General view

- In most engines with a carburetor, vaporized fuel is conveyed to the cylinders through a branched pipe called the intake manifold and, in many engines, a similar exhaust manifold is provided to carry off the gases produced by combustion. The fuel is admitted to each cylinder and the waste gases exhausted through mechanically operated poppet valves or sleeve valves. The valves are normally held closed by the pressure of springs and are opened at the proper time during the operating cycle by cams on a rotating camshaft that is geared to the crankshaft. By the 1980s more sophisticated fuel-injection systems, also used in diesel engines, had largely replaced this traditional method of supplying the proper mix of air and fuel. In engines with fuel injection, a mechanically or electronically controlled monitoring system injects the appropriate amount of fuel directly into the cylinder or inlet valve at the appropriate time. The gas vaporizes as it enters the cylinder. This system is more fuel efficient than the carburetor and produces less pollution.

Working of Valves in 4-Stroke IC/SI Engine/ Otto-Cycle Engine

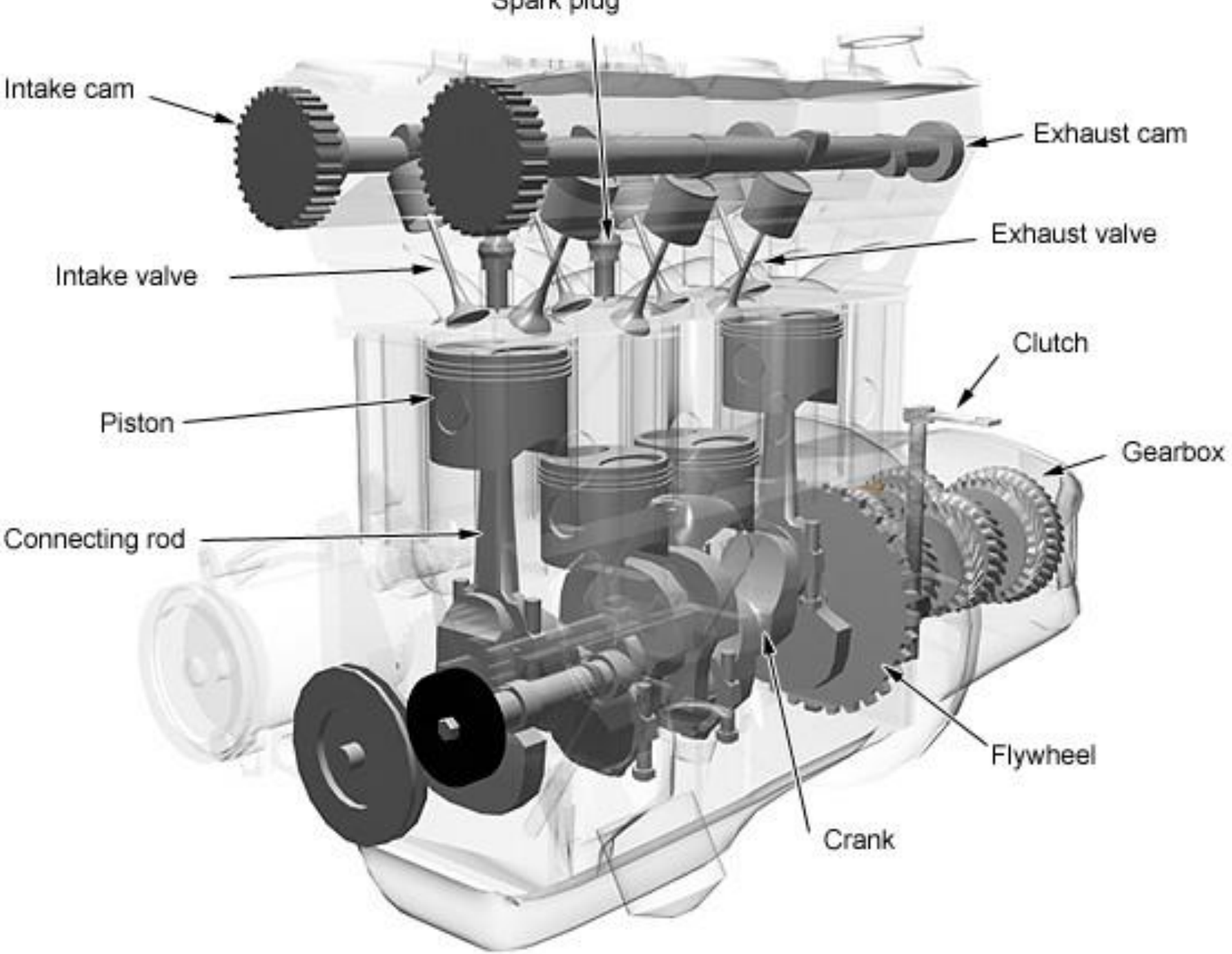


Working of Valves in 4-Stroke IC Engine/ Otto-Cycle Engine



FUNCTION OF FUEL SYSTEM

- The function of fuel system is to supply the engine with fuel in qualities exactly metered in proportion to the power required and timed with utmost accuracy, so that the engine will deliver that power within the limits prescribed for fuel consumption, exhaust smoke, noise and exhaust emissions.
- The fuel must be injected through suitable nozzles at pressures high enough to cause the required degree of atomization in the combustion chamber and to ensure that it mixes with sufficient air for complete combustion in the cycle time available.
- In multi cylinder engines the periods of injection, the timing and the delivered quantity must be accurately metered to ensure an even balance between the cylinders.


Spark plug
Intake cam
Exhaust cam
Exhaust valve
Intake valve
Clutch
Piston
Gearbox
Connecting rod
Flywheel
Crank

FUEL SYSTEM

- **In the past**

  F**uel** metering in automotive engines was usually performed by a carburetor. However, this device has been largely replaced by fuel injection into the intake manifold or ports, which increases fuel economy and efficiency while lowering exhaust gas emissions. Various types of fuel management systems are used on automotive engines, including electronically controlled feedback carburetors, mechanical continuous fuel injection, and sequential electronic fuel injection.

OBJECTIVES OF THE FUEL INJECTION SYSTEM

- The injection system of the compression ignition engine should fulfill the following objectives consistently and precisely:

1. Meter the appropriate quantity of fuel, as demanded by the speed of, and the load on, the engine at the given time.
2. Distribute the metered fuel equally among cylinders in a multi-cylinder engine.
3. Inject the fuel at the correct time (with respect to crank angle) in the cycle.

OBJECTIVES OF THE FUEL INJECTION SYSTEM

4. Inject the fuel at the correct rate (per unit time or crank angle degree).
5. Inject the fuel with the correct spray pattern and sufficient atomization as demanded by the design of the combustion chamber, to provide proper penetration also.
6. Begin and end injection sharply without dribbling or after injection.

FUNCTIONAL ELEMENTS

- To accomplish these objectives, a number of functional elements are required. These constitute together, the fuel injection system of the engine. These elements are as follows.
- Pumping elements to transfer the fuel from the tank to the cylinder, along with the associate piping and hardware.
- Metering elements to measure and supply the fuel at the rate as desired by the speed and load conditions prevailing.

FUNCTIONAL ELEMENTS

- Metering controls to adjust the rate of the metering elements for changes in load and speed of the engine.
- Distributing elements to divide the metered fuel equally among the cylinders in a multi cylinder engine.
- Timing controls to adjust the start and stop of injection.
- Mixing elements to atomize and distribute the fuel within the combustion chamber

Components of fuel supply system of an internal-combustion engine.

- The fuel supply system of an internal-combustion engine consists of
- Fuel Tank
- Fuel Lines
- Fuel Pump
- Fuel Filters
- And a device, Atomizer, for vaporizing or atomizing the liquid fuel. In Otto-cycle engines this device is either a carburetor or, more recently, a fuel-injection system.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

- Fuel tank stores the fuel for engine.
- Tank location and design are always a compromise with available space. Most automobiles have a single tank located in the rear of the vehicle.
- Fuel tanks today have internal baffles to prevent the fuel from sloshing back and forth. If you hear noises from the rear on acceleration and deceleration the baffles could be broken.
- All tanks have a fuel filler pipe, a fuel outlet line to the engine and a vent system.
- All catalytic converter cars are equipped with a filler pipe restrictor so that leaded fuel, which is dispensed from a thicker nozzle, cannot be introduced into the fuel system.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

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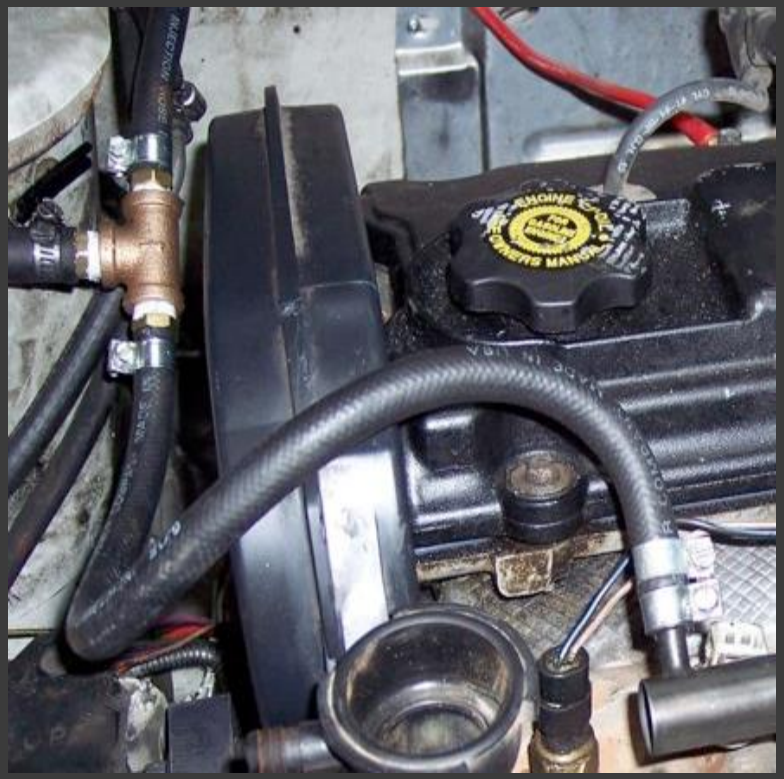
COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

FUEL LINES

- Steel lines and flexible hoses carry the fuel from the tank to the engine.
- When servicing or replacing the steel lines, copper or aluminum must never be used. Steel lines must be replaced with steel. When replacing flexible rubber hoses, proper hose must be used.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

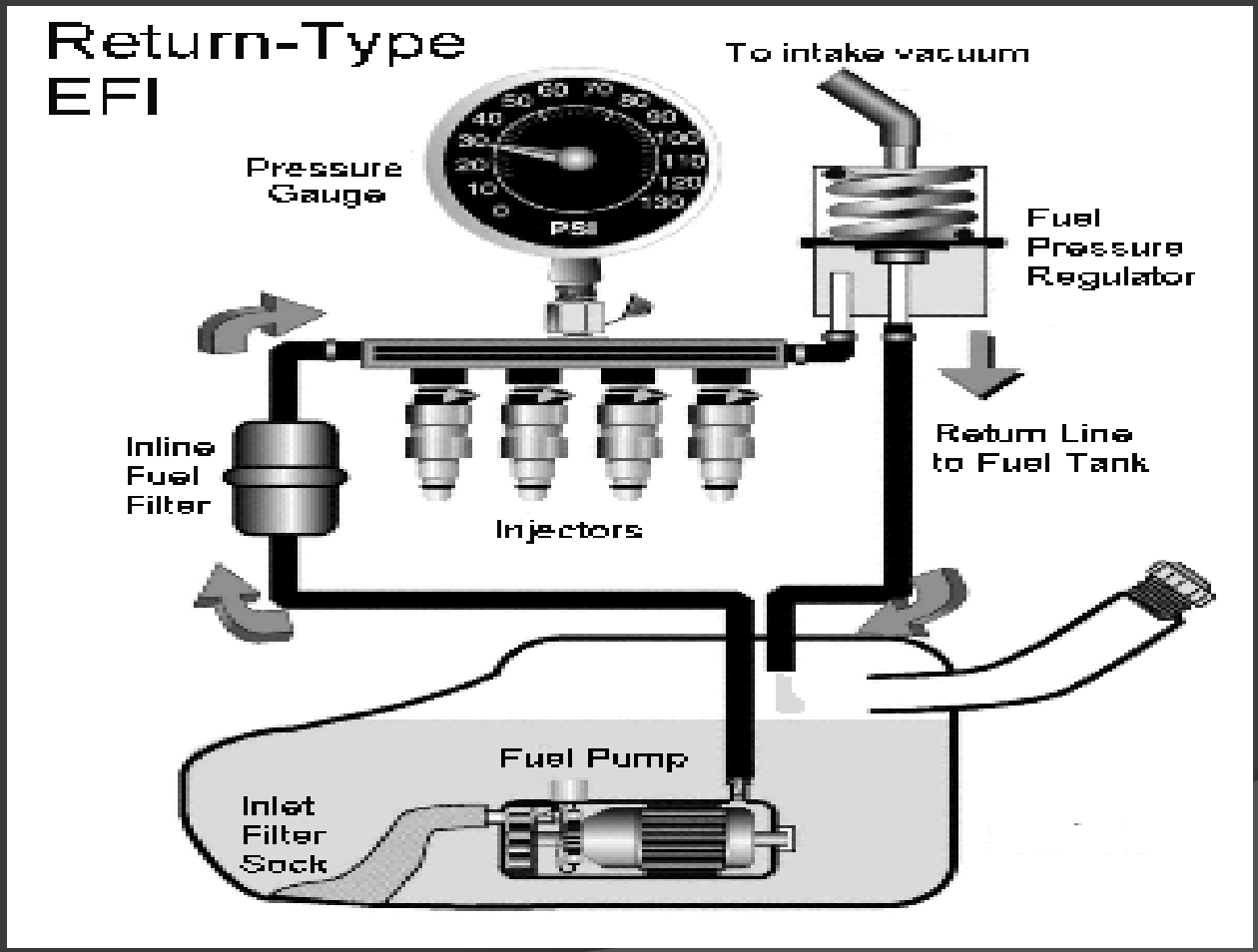


COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

FUEL PUMP

- A fuel pump is the device that transfers fuel from the fuel tank into an internal combustion engine.
- A fuel pump is an essential component on a car or other internal combustion engine device. Fuel has to be pumped from the fuel tank to the engine and delivered under low pressure to the carburetor or under high pressure to the fuel injection system. Some fuel injected engines have two fuel pumps for this purpose: one low pressure/high volume supply pump in the tank and one high pressure/low volume pump on or near the engine.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.



Components of Fuel Supply System of an Internal-Combustion Engine.

Fuel pump

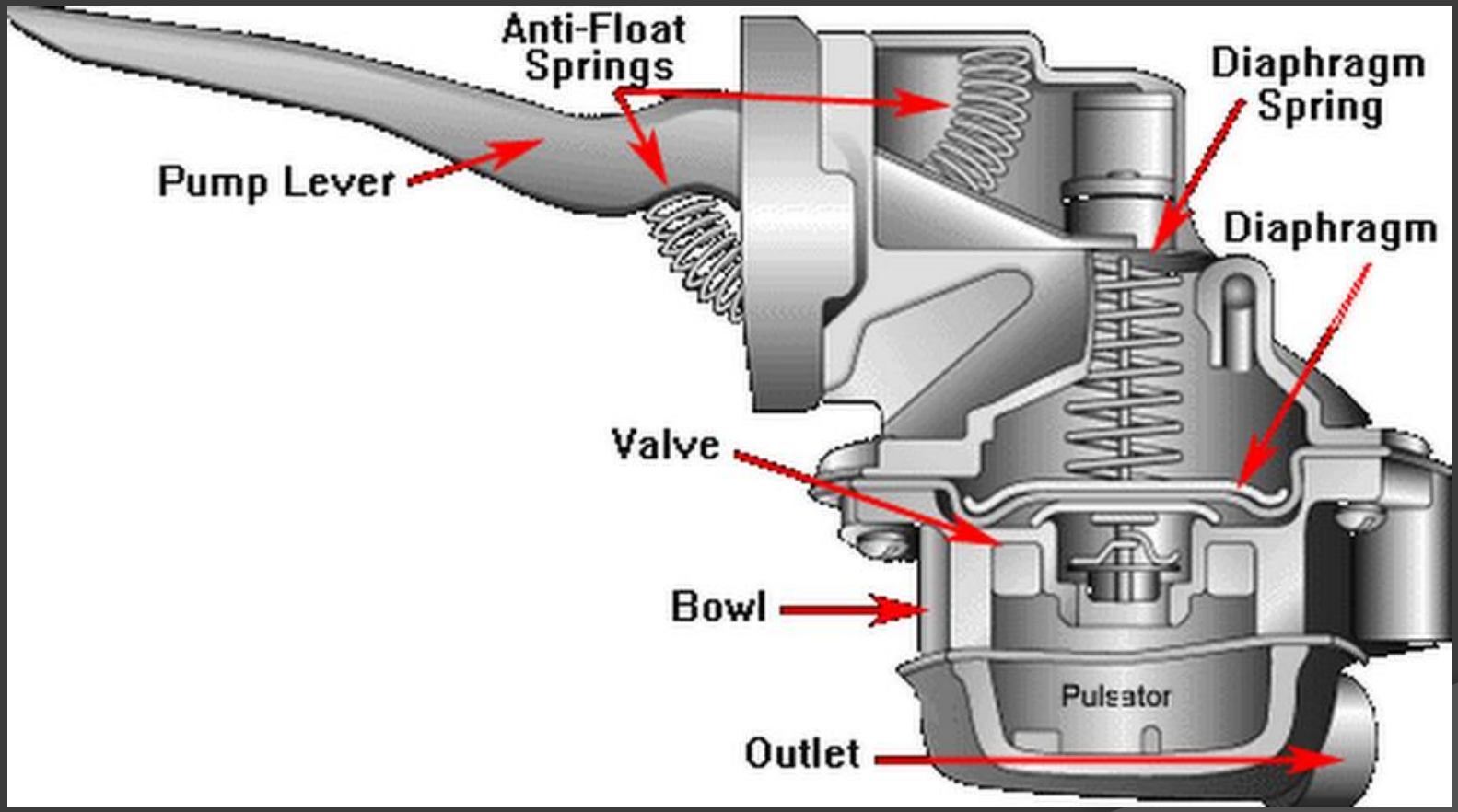
- Types of Fuel Pump
- Two types of fuel pumps are used in automobiles:
  1. Mechanical
  2. Electric

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

FUEL PUMP

- MECHANICAL FUEL PUMP
- Carbureted cars use mechanical fuel pumps.
- Mechanical fuel pumps are diaphragm pumps, mounted on the engine and operated by an eccentric cam usually on the camshaft. A rocker arm attached to the eccentric moves up and down flexing the diaphragm and pumping the fuel to the engine.
- While mechanical pumps operate on pressures of 4-6 psi (pounds per square inch).

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.



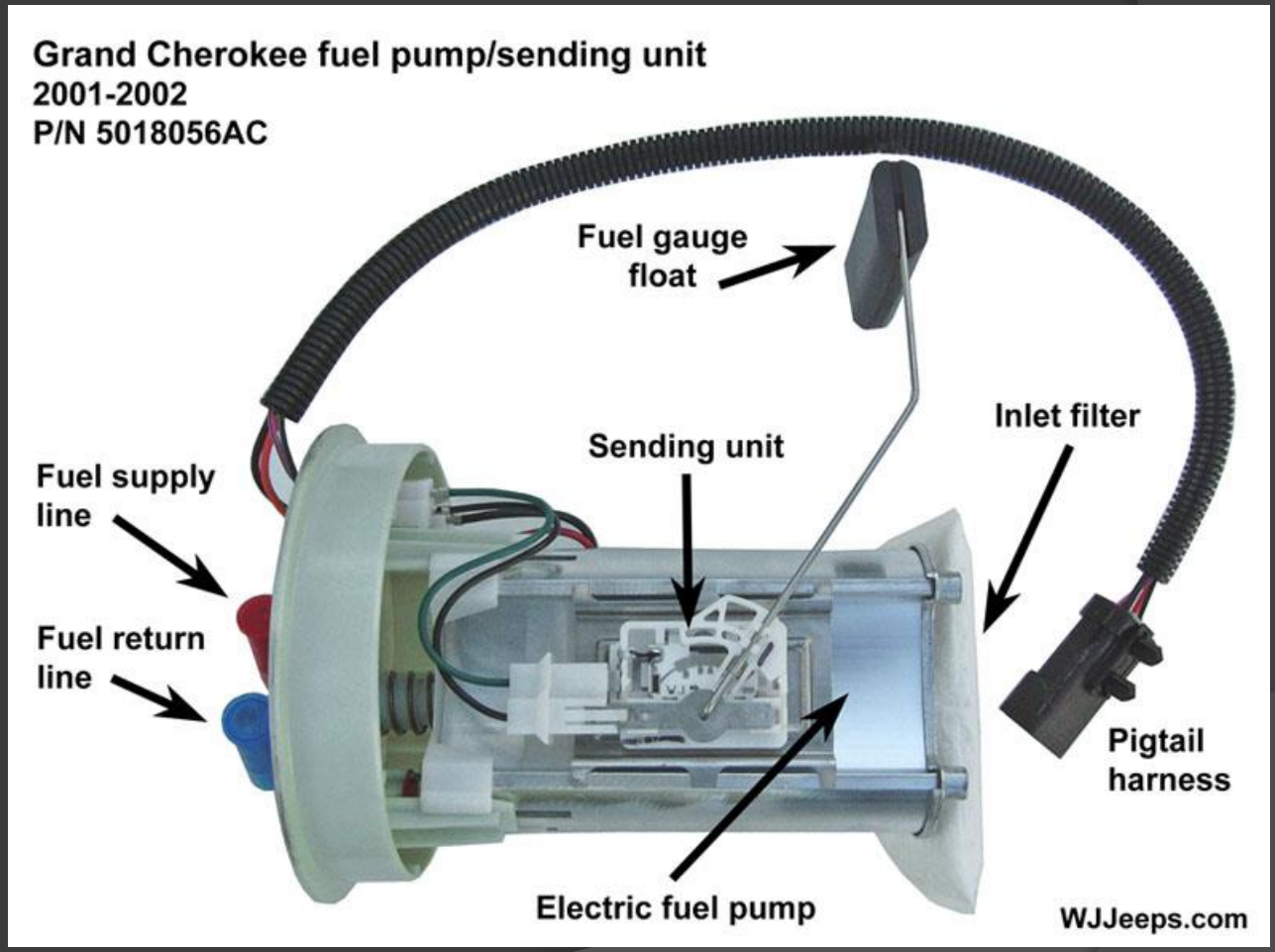
COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

FUEL PUMP

- ELECTRIC FUEL PUMP
- All fuel injected cars today use electric fuel pumps.
- Electric pumps do not depend on an eccentric for operation, they can be located anywhere on the vehicle. In fact they work best when located near the fuel tank.
- Electric pumps can operate on pressures of 30-40 psi.
- Current is supplied to the pump immediately when the key is turned. This allows for constant pressure on the system for immediate starting. Electric fuel pumps can be either low pressure or high pressure.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

Fuel pump



COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

FUEL PUMP

FUEL PUMP SAFETY

- Fuel pump creates positive pressure in the fuel lines, pushing the gasoline to the engine. The higher gasoline pressure raises the boiling point. Placing the pump in the tank puts the component least likely to handle gasoline vapor well (the pump itself) farthest from the engine, submersed in cool liquid. Another benefit to placing the pump inside the tank is that it is less likely to start a fire. Though electrical components (such as a fuel pump) can spark and ignite fuel vapors, liquid fuel will not explode and therefore submerging the pump in the tank is one of the safest places to put it. In most cars, the fuel pump delivers a constant flow of gasoline to the engine; fuel not used is returned to the tank. This further reduces the chance of the fuel boiling, since it is never kept close to the hot engine for too long.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

FUEL PUMP

OPERATING A FUEL PUMP

- The fuel pump is generally on whenever the car's ignition switch is in the "on" position. Depressing the gas pedal results in the throttle body opening on the engine (metering the air going in) rather than engaging the fuel pump. The ignition switch does not carry the power to the fuel pump, instead it activates a relay which will handle the higher current load. It is common for the fuel pump relay to become oxidized and cease functioning; this is much more common than the actual fuel pump failing.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

FUEL PUMP

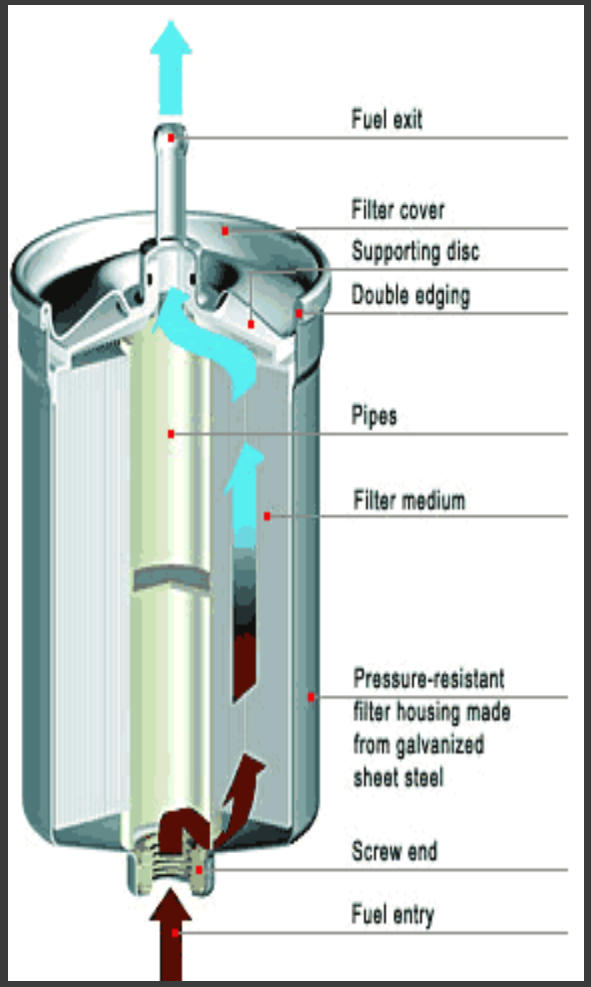
FUEL PUMPS IN AN ACCIDENT

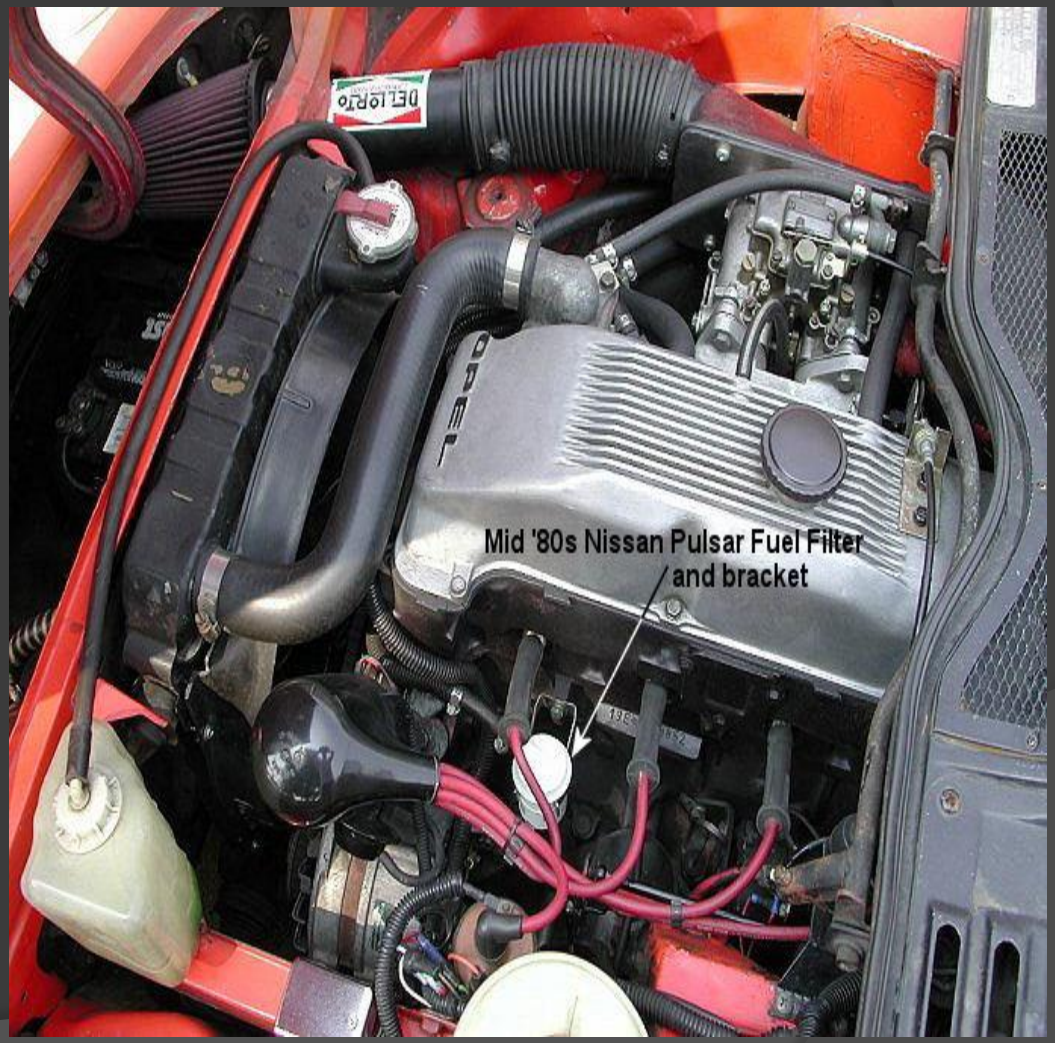
- Some cars with an electronic control unit have safety logic that will shut the electric fuel pump off even if the ignition is "on" if there is no oil pressure, either due to engine bearing damage or a stalled engine in a car accident. In case of an accident this will also prevent fuel leaking from any ruptured fuel line. Other cars have an additional roll over valve, that will shut off the fuel pump in case the car rolls over.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

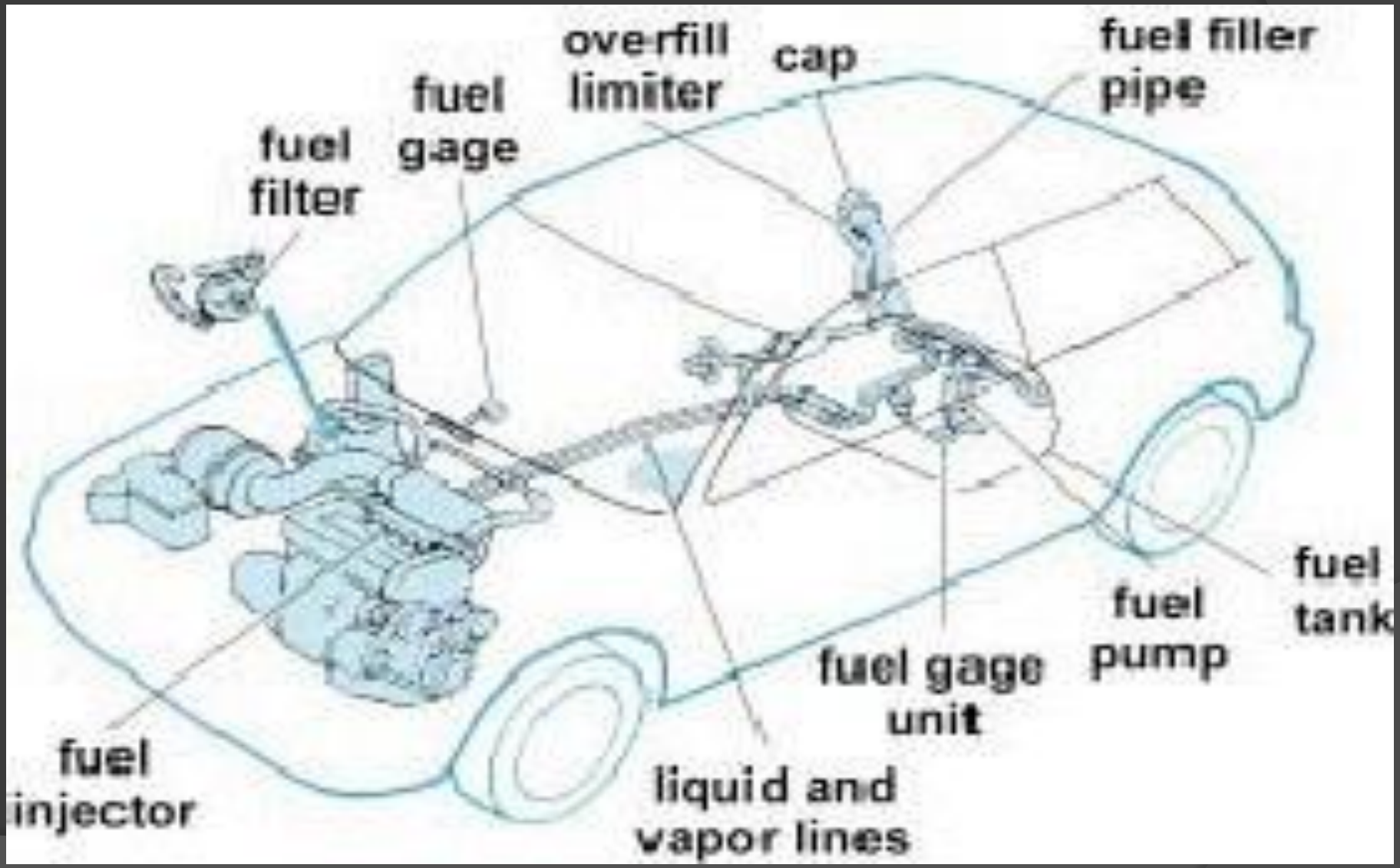
- The fuel filter is the key to a properly functioning fuel delivery system. This is more true with fuel injection than with carbureted cars.
- Fuel injectors are more susceptible to damage from dirt because of their close tolerances, but also fuel injected cars use electric fuel pumps.
- When the filter clogs, the electric fuel pump works so hard to push past the filter, that it burns itself up. Most cars use two filters.
- One inside the gas tank and one in a line to the fuel injectors or carburetor. Unless some severe and unusual condition occurs to cause a large amount of dirt to enter the gas tank, it is only necessary to replace the filter in the line.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.





FUEL SYSTEM


overfill limiter
cap
fuel filler pipe
fuel gage
fuel filter
fuel tank
fuel pump
fuel gage unit
fuel injector
liquid and vapor lines

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

ATOMIZER

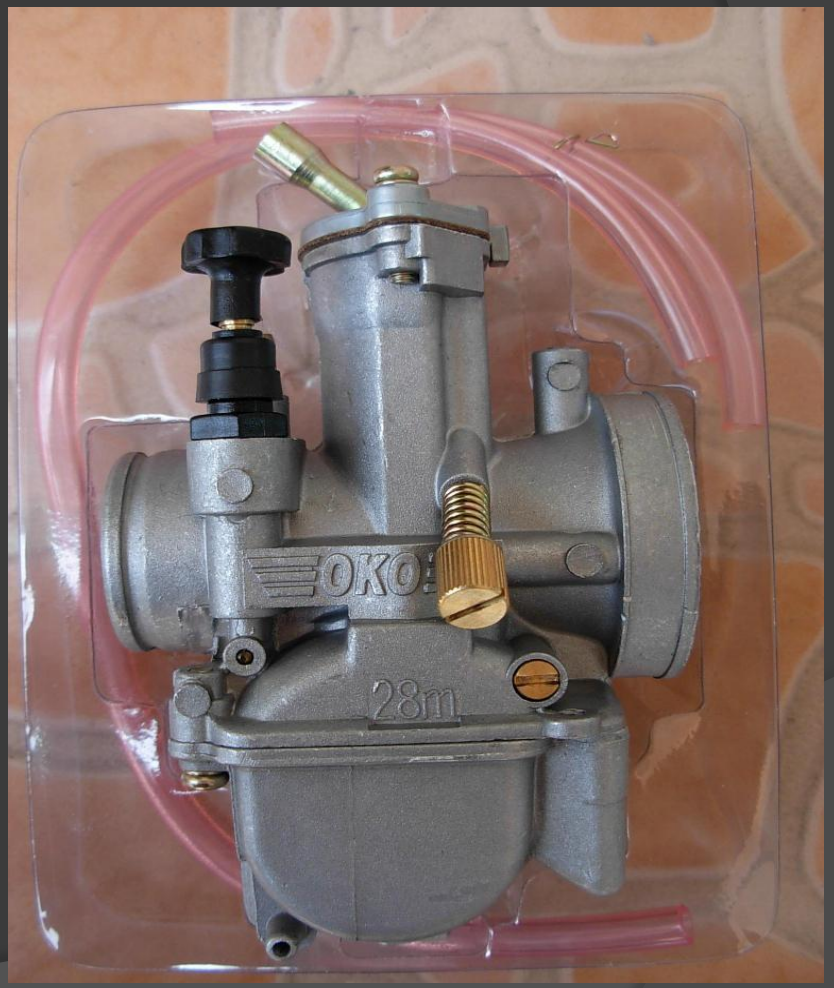
- Atomization is conversion of bulk liquid into a spray or mist (i.e. collection of drops), often by passing the liquid through a nozzle. Despite the name, it does not imply that the particles are reduced to atomic sizes.
- An atomizer is an atomization apparatus; carburetors, airbrushes, misters, and spray bottles are only a few examples of atomizers used universally. In internal combustion engines, fine-grained fuel atomization is instrumental to efficient combustion.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

CARBURETOR

- Carburetor, device that mixes fuel and air for burning in an internal-combustion engine. A carburetor *atomizes* (converts into a vapor of tiny droplets) liquid gasoline. An airflow carries the atomized gasoline to the engine's cylinders, where the gas is ignited.
- The carburetor has been part of internal-combustion engines since the beginning of the 20th century. In most passenger vehicles and light trucks built since 1985 the carburetor has been replaced by fuel injection, a more efficient, computer-controlled method of injecting fuel into the engine. Diesel engines, because of their design, have always used fuel injection instead of carburetors. Carburetors today are found only on older gasoline engines in cars and trucks. They are still common in boat engines, aircraft engines, and some sports vehicles, including jet-skis and motorcycles.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.



COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

CARBURETOR

FUNCTIONS OF CARBURETOR

1) it combines gasoline and air creating a highly combustible mixture.
2) it regulates the ratio of air and fuel.
3) it controls the engine's speed

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

CARBURETOR

- A carburetor basically consists of an open pipe, the carburetor's "throat" or "barrel", through which the air passes. The pipe is in the form of a venturi - it narrows in section and then widens again.
- Just after the narrowest point is a butterfly valve or throttle - a rotating disc that can be turned end-on to the airflow, so as to hardly restrict the flow at all, or can be rotated so that it (almost) completely blocks the flow of air.
- This valve controls the flow of air through the carburetor throat and thus the quantity of air/fuel mixture the system will deliver. This in turn affects the engine power and speed. The throttle is connected, via a Bowden cable or a set of rods and ball joints, to the accelerator pedal on a car or the equivalent control on other vehicles or equipment.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

CARBURETOR

- ## THROTTLE VALVE
- A throttle valve at the base of the carburetor controls the amount of air pulled through the engine by the partial vacuum in the pistons. The driver opens the throttle valve by pressing down on the accelerator (gas pedal). As the valve opens wider, more air flows through the carburetor, delivering larger amounts of fuel to the engine. The driver closes the throttle valve by decreasing pressure on the gas pedal.
- ## FLOAT BOWL
- The fuel that enters the carburetor is stored in a reservoir called a float chamber or float bowl. A device that floats on the reservoir's surface is linked to a small valve, which keeps a constant amount of fuel in the reservoir.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

CARBURETOR

VENTURI

- Carburetors pull fuel into the airflow using a principle called Bernoulli's effect, named for Dutch-born Swiss scientist Daniel Bernoulli. Bernoulli discovered that pressure in a fluid decreases as its velocity increases. Italian physicist Giovanni Venturi (1746-1822) designed a specialized type of passageway for fluids based on Bernoulli's effect. A carburetor has such a passageway, called a venturi, in its throat.
- The venturi is a narrowing of the carburetor's throat and makes the throat look a little like an hourglass—narrow in the middle and wider at the ends. Air rushing through the narrow part speeds up. At the same time, air pressure against the sides of the passageway decreases, creating a partial vacuum inside the throat. This partial vacuum draws fuel through the nozzle and into the air.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

CARBURETOR

- Venturis are also used to measure the speed of a fluid, by measuring pressure changes from one point to another along the venturi. Placing a liquid in a U-shaped tube and connecting the ends of the tubes to both ends of a venturi is all that is needed. When the fluid flows though the venturi the pressure in the two ends of the tube will differ, forcing the liquid to the "low pressure" side. The amount of that move can be calibrated to the speed of the fluid flow.
- To avoid undue drag, a venturi typically has an entry cone of 30 degrees and an exit cone of 5 degrees.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

CARBURETOR

Fig. 11.5, shows a schematic diagram of a simple or elementary carburettor.

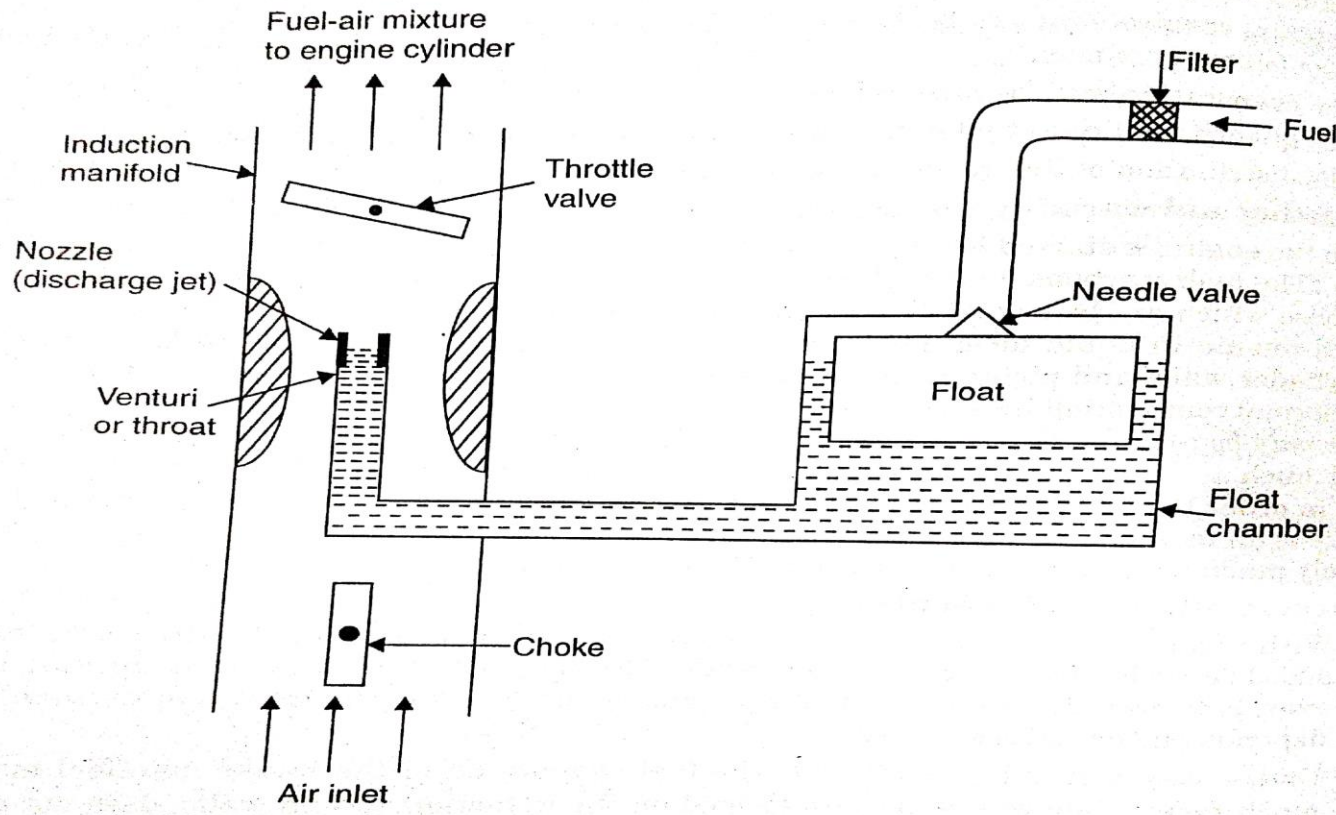


Fig. 11.5. A simple or elementary carburettor.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

CARBURETOR

- IDLE AND TRANSFER PORTS
- In addition to the main nozzle in the venturi portion of the carburetor, two other nozzles, or ports, deliver fuel to the engine. The idle port is located below the venturi and allows the engine to get fuel when airflow through the carburetor is minimal, such as when the engine is idling at a low speed. An off-idle or transfer port located just above the idle port delivers additional fuel at low engine speeds. Fuel from these two ports is drawn into the cylinders by engine vacuum. The two ports supply enough fuel to keep the engine running at slow speeds. Fuel from the main nozzle is necessary to run the engine at normal operating speeds.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

CARBURETOR

- AIR-FUEL RATIO
- A carburetor can be adjusted to mix larger or smaller amounts of air with the fuel. An idling engine at normal operating temperature requires an air-to-fuel ratio of about 14.6 to 1 or 15-to-1 (by weight) to completely burn the fuel. Raising or lowering the air ratio makes the mix either lean (containing less fuel) or rich (containing more fuel). A lean mixture produces a cleaner, hotter combustion for cruising speeds, but not enough fuel for starting the engine efficiently or allowing it to produce more power. A rich mixture is easier for the engine to burn, but produces more pollutants as byproducts.
- The carburetor is adjusted to provide a rich mixture for cold engine starts because the rich mixture burns easier and longer. As the engine warms up, the carburetor alters the air-fuel ratio for a leaner mixture.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

CARBURETOR

CHOKE AND COLD STARTS

- The choke is a device that can partially block air from getting into the carburetor. If the throttle valve is open and the choke valve is closed, the vacuum from the engine is strong enough inside the carburetor to draw fuel from all three nozzles. This added fuel produces a rich air-fuel ratio to help a cold engine get started. Once the engine is warm, the choke is shut off. Early automobiles had manually operated chokes. The process eventually became automatic and electronically controlled.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

CARBURETOR

CARBURETOR ADJUSTMENT

- Too much fuel in the fuel-air mixture is referred to as too "rich"; not enough fuel is too "lean". The "mixture" is normally controlled by adjustable screws on an automotive carburetor or a pilot-operated lever on a propeller aircraft (since mixture is air density (altitude) dependent). The correct air to petrol ratio is 14.6:1, meaning that for each weight unit of petrol, 14.6 units of air will be burned. Carburetor adjustment can be checked by measuring the carbon monoxide and oxygen content of the exhaust fumes. A more sophisticated way to determine correct mixture, as used in modern fuel injected engines, is by using a lambda sensor in the exhaust system. The lambda sensor output is fed to the engine management system that in turn will adjust the amount of injected fuel.
- The mixture can also be judged by the state and color of the spark plugs: black, dry sooty plugs indicate a too rich mixture, white to light grey deposits on the plugs indicate a lean mixture. The correct color should be a brownish grey.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

CARBURETOR

- HOW A CARBURETOR MIXES FUEL AND AIR?
- When the piston moves down the cylinder on the intake stroke it draws air from the cylinder and intake manifold. A vacuum is created that draws air from the carburetor. The airflow through the carburetor causes fuel to be drawn from the carburetor through the intake manifold past the intake valves and into the cylinder. The amount of fuel mixed into the air to obtain the required air to fuel ratio is controlled by the venturi or choke.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

CARBURETOR

- DELIVERING GASOLINE TO THE CARBURETOR
- Gasoline is delivered to the carburetor by the fuel pump and is stored in the fuel bowl. To keep this level of fuel stored in the bowl constant under all conditions a float system is used. A float operated needle valve and seat at the fuel inlet is used to control the fuel level in the bowl. If the fuel level drops below a certain level the float lowers and opens the valve letting more fuel in. When the float rises it pushes the inlet valve against the seat and shuts off the flow of fuel into the bowl.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

CARBURETOR

Fig. 11.5, shows a schematic diagram of a simple or elementary carburettor.

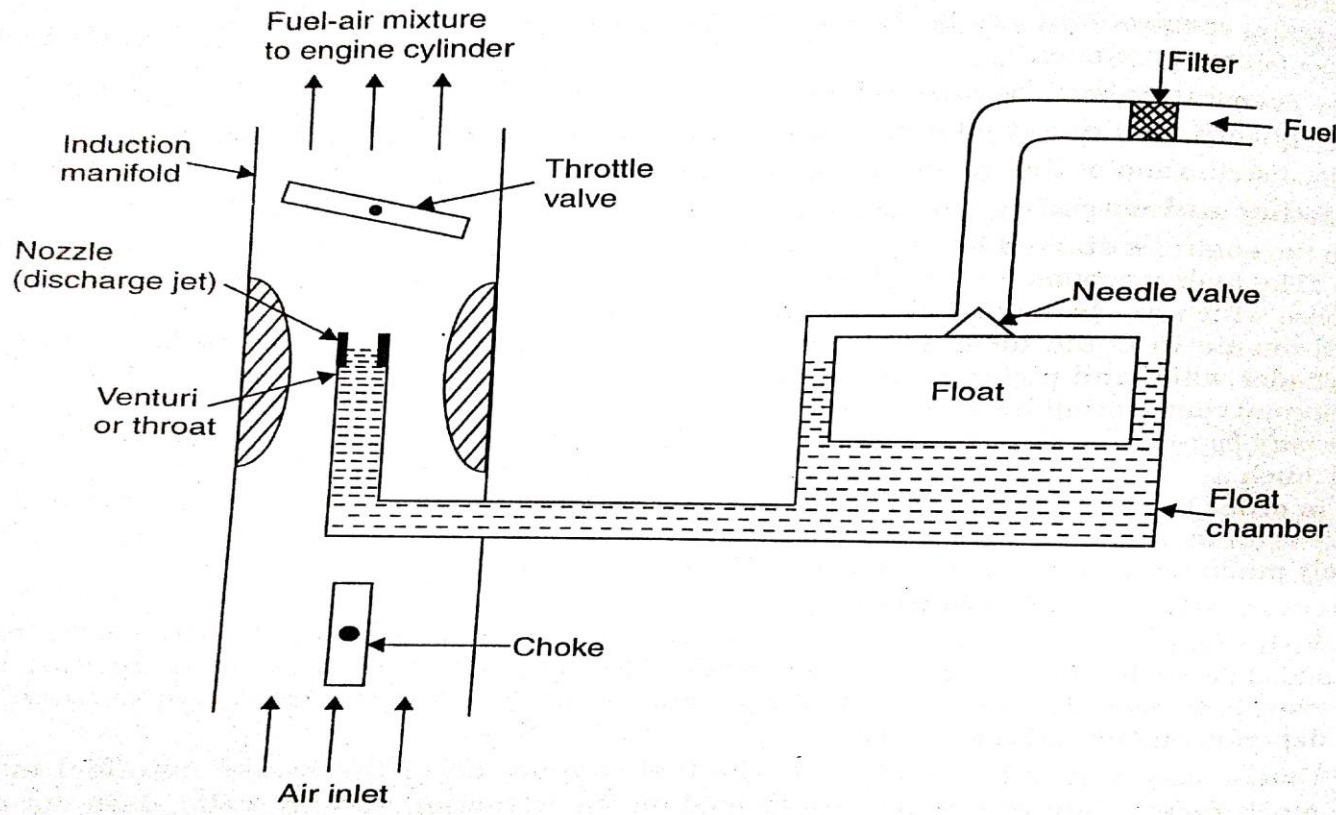


Fig. 11.5. A simple or elementary carburettor.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

CARBURETOR

- CONTROLLING THE SPEED OF THE ENGINE
- The throttle controls the speed of the engine by controlling the amount of air fuel allowed in the engine. The throttle is a butterfly valve located after the venturi and is opened by pressing on the gas pedal. The farther the valve is opened the more air/fuel mixture is let into the engine and the faster the engine runs. At low engine speeds when the throttle is only open a little there is not enough air flow to pull in fuel.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

CARBURETOR

HANDLING LOW SPEEDS

- When the engine is idle there is very little air flowing through the venturi because the throttle valve is closed. The idle port allows the engine to operate under this condition. Fuel is forced through the idle port because of a pressure differential between air in the fuel bowl and vacuum below the throttle valve. Idle fuel mixture is controlled by an adjustable needle valve.

HANDLING HIGH SPEEDS

- At higher engine speeds more fuel is drawn from the main nozzle. Fuel comes from the fuel bowl through the fuel nozzle and into the throat of the carburetor where it mixes with air.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

CARBURETOR

- THE CARBURETOR UNDER HIGH ENGINE LOAD
- Higher engine loads demand more fuel. The carburetor handles this by increasing the amount of fuel through the power valve controlled by the intake manifold vacuum. Manifold vacuum travels from the base of the carburetor to the power valve through a passage. As the engine load is increased the vacuum drops and the power valve starts to open. The valve will be completely opened when the engine is under a heavy load resulting in very low vacuum.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

CARBURETOR

- THE CARBURETOR DURING ENGINE ACCELERATION
- When an engine initially accelerates the balance of air and fuel is thrown off balance because fuel is heavier than air. This results in more air than fuel, an overly lean mixture. To solve this, the accelerator pump is used to supply more fuel to the engine. This maintains the balance until the fuel air ratio reaches proper levels. The accelerator pump is operated by a linkage and does not rely on vacuum to operate.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

CARBURETOR

- ## THE CARBURETOR UNDER COLD ENGINE STARTING CONDITIONS
- Cold engine starting uses more fuel because the fuel is not fully vaporized due to less air in the carburetor. To increase the amount of fuel during starting the choke plate is used. When the choke plate is closed the vacuum in the carburetor increases and pulls more fuel from the fuel nozzle and both the idle ports. The choke is usually thermostatically controlled but can be controlled manually. Once the engine gets started the amount of extra gas for starting needs to reduced. This is done by using the vacuum in the intake manifold, which pulls the choke partially opened to stop too much gas from flowing in the engine and allowing more air flow while the engine starts. As the engine warms up the thermostat control of the carburetor opens the plate until the engine reaches normal temperature. At normal running engine temperature, the plate will be fully open.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

CARBURETOR

- TYPES OF CARBURETORS
- There are two types of carburetors:

1. Fixed choke
2. Constant depression

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

CARBURETOR

- FIXED CHOKE CARBURETORS
- Constant choke carburetor is the type of carburetor in which the air and fuel flow area is always kept constant. In constant choke carburetor, the air-fuel ratio is changed due to varying pressure difference or depression as per the demand. This type of carburetor should have a compensating device to avoid air-fuel mixture enrichment with the increase in speed. Example: Solex carburetor and Zenith
- This is the common downdraft carburetor found on American and most Japanese cars.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

CARBURETOR

- ## CONSTANT DEPRESSION CARBURETORS
- The constant depression carburetors vary the airflow to change the fuel jet opening which in turn alters the fuel flow. A vacuumed operated piston connected to a tapered needle, which slides inside the fuel jet, does this. The most common variable choke (constant depression) type carburetor is the side draft SU carburetor, which was simple in principle to adjust and maintain. This rose to a position of domination in the UK car market for that reason. Other similar designs are used on some European and a few Japanese automobiles

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

CARBURETOR

- Carburetor is also categories as

- Natural or side draft
- Updraft
- Downdraft

Types of Carburetor:

What are the types of a carburetor? There are three types of carburetors according to the direction in which the mixture is supplied.

- ***Up-draft carburetor***
- ***Horizontal type carburetor***
- ***Down-draft type carburetor***

If the air is supplied from the bottom of the mixing chamber then it is called an **up-draft type**.

If the air is supplied from one side of the carburetor then it is called **horizontal type carburetor.**

And last if the air is supplied from the above portion of the mixing chamber then it is called **down-draft carburetor.**

In most cases down-draft type carburetor is generally used because of the following advantages:

- The gravity assists the flow of the mixture. so found that the engine pulls better at lower speeds under load.
- The engine can achieve a higher value of volumetric efficiency.
- The carburetor position is rendered more accessible.

And the only disadvantage is:

The possibility of leakage going directly into the inlet manifold if the float is defective and the jet is overflowing.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

CARBURETOR

- NATURAL DRAFT CARBURETOR
- This carburetor is used where there is little space on top of the engine. The air horizontally into the manifold.

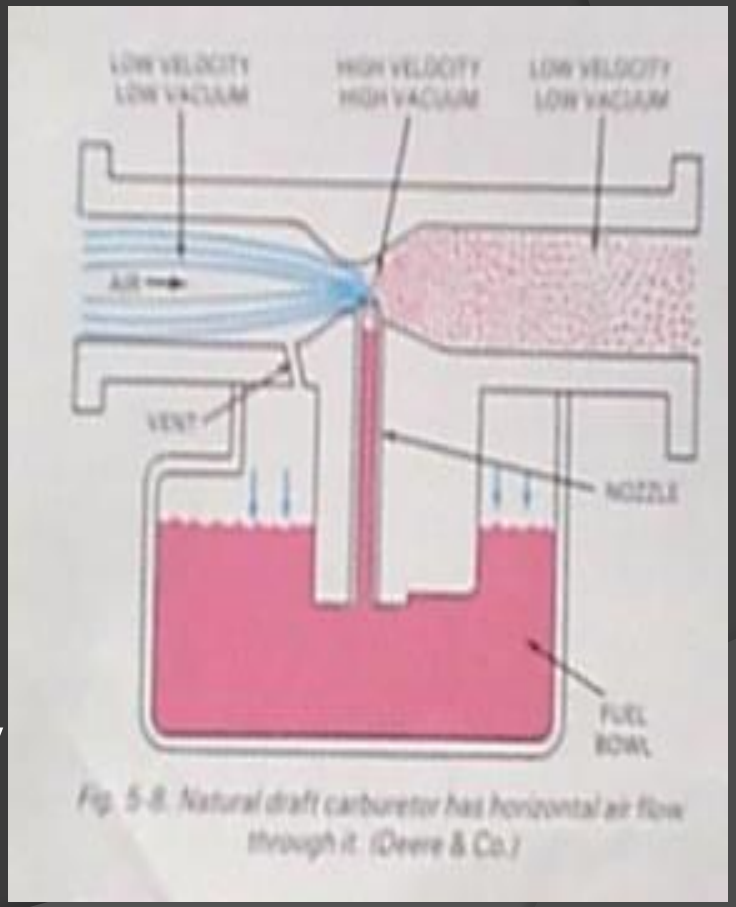


Fig. 5-8. Natural draft carburetor has horizontal air flow through it. (Deere & Co.)

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

CARBURETOR

- UPDRAFT CARBURETORS
- This type is placed low on the engine and use a gravity fed-fuel supply.
- Even this carburetor uses gravity to receive the fuel from the tank, the air-fuel mixture must be forced upward into the engine.

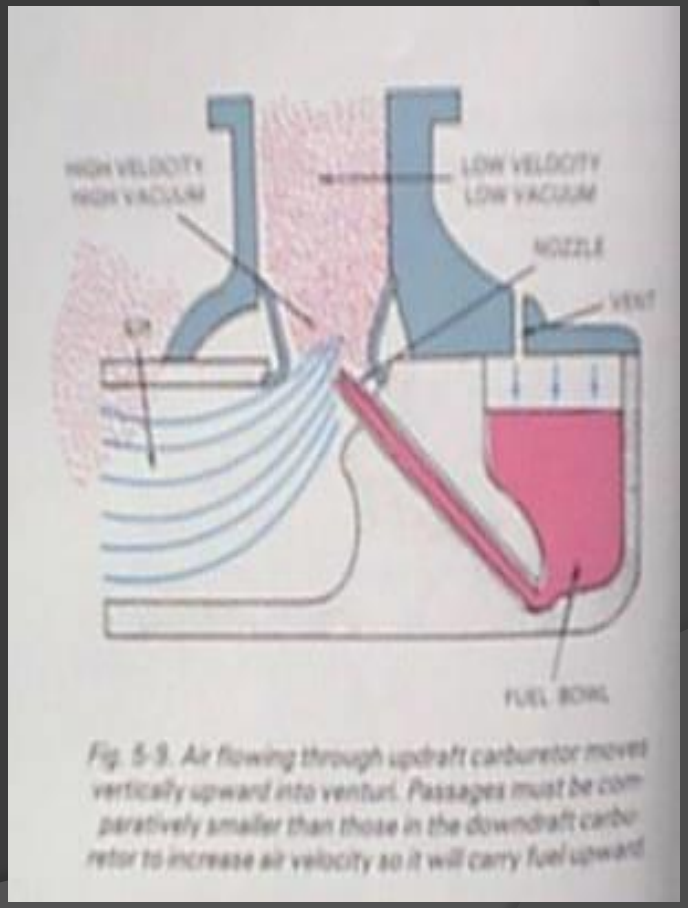


Fig. 5-9. Air flowing through updraft carburetor moves vertically upward into venturi. Passages must be comparatively smaller than those in the downdraft carburetor to increase air velocity so it will carry fuel upward.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

CARBURETOR

- DOWNDRAFT CARBURETORS
- This carburetor operates with lower air velocities and larger passages. This is because gravity assists the air-fuel mixture flow to the cylinder.

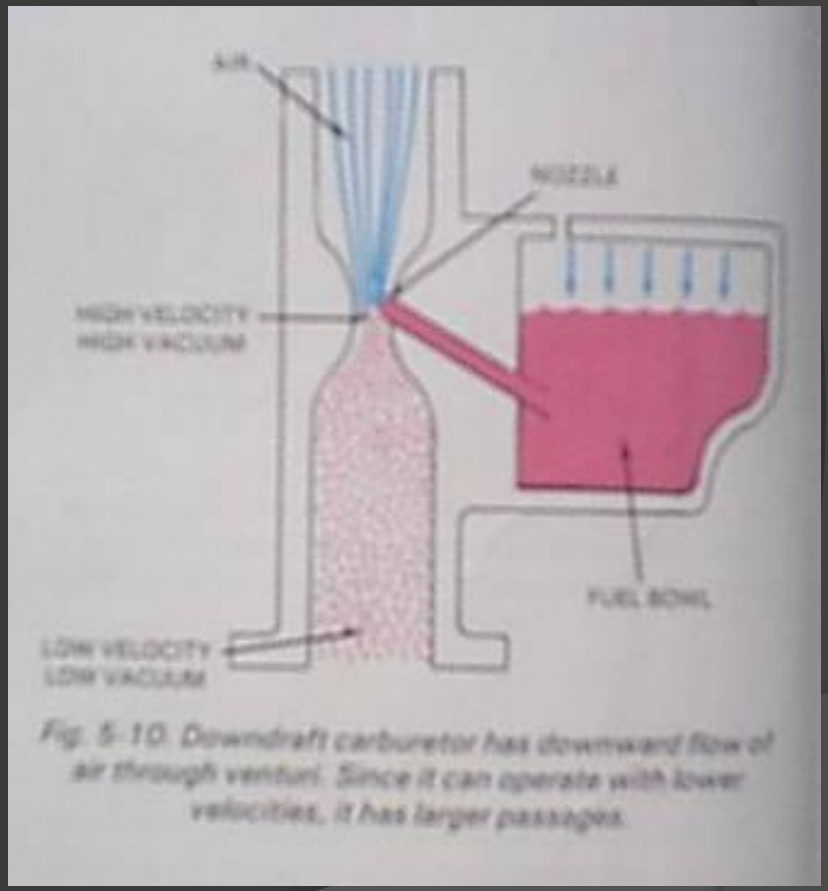


Fig. 5-10. Downdraft carburetor has downward flow of air through venturi. Since it can operate with lower velocities, it has larger passages.

COMPONENTS OF FUEL SUPPLY SYSTEM OF AN INTERNAL-COMBUSTION ENGINE.

CARBURETOR

- DOWN-DRAFT CARBURETORS
- The downdraft carburetor can provide large volumes of fuel when needed for high speed and high power output.

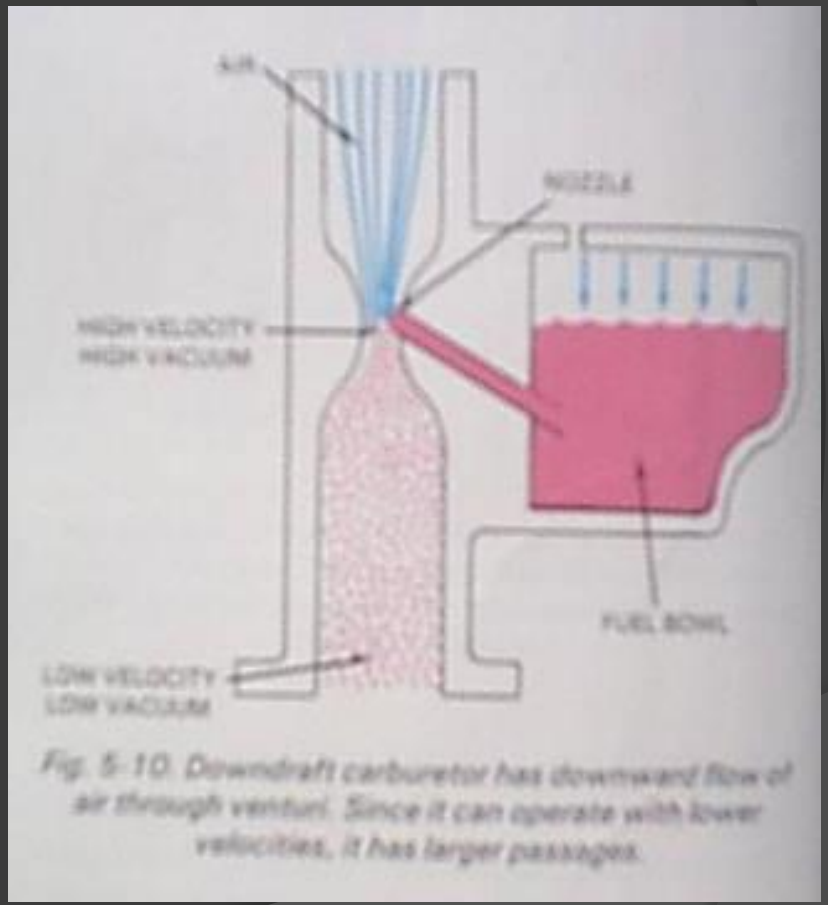


Fig. 5-10. Downdraft carburetor has downward flow of air through venturi. Since it can operate with lower velocities, it has larger passages.