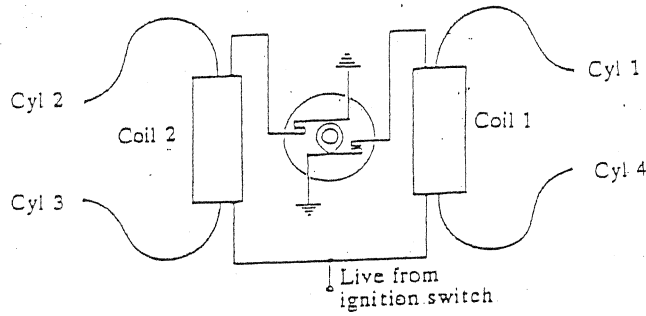


Wasted Spark DIS

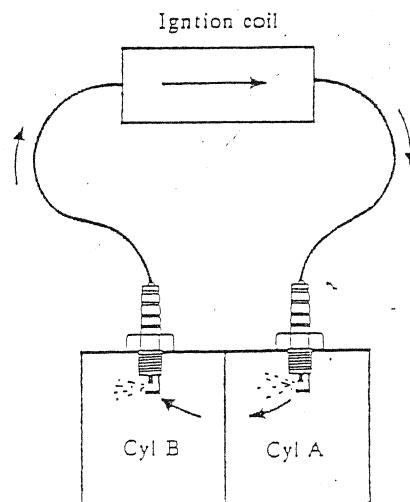
The wasted spark distributorless ignition system utilises one ignition coil to provide a spark to two plugs. This design is only suitable where a pair of pistons rise and fall together, i.e. conventional 4-cylinder engine.

One coil is used to 'fire' plugs 1 and 4 and a second coil is used to 'fire' plugs 2 and 3.

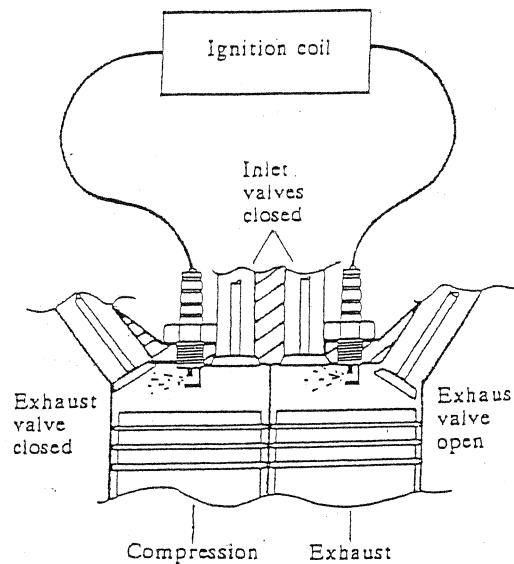


The ignition coil is similar to the conventional coil, there is still a primary and secondary winding. The secondary winding however, is open at both ends, each end connected to a spark plug.

The voltage produced in the secondary winding will pass down the lead to spark plug 'A' and across the plug gap to the engine and the continue through the gap of spark plug 'B', up the lead back to the ignition coil winding.

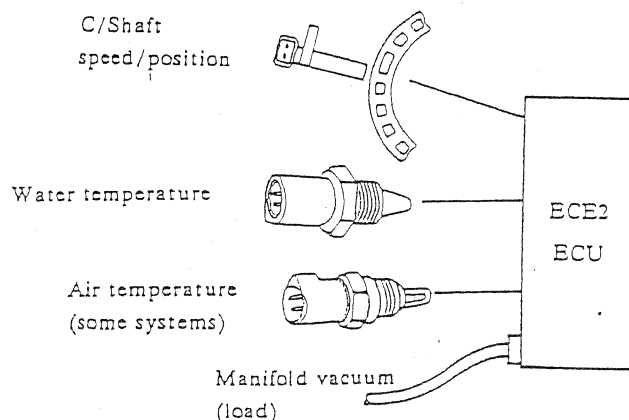


Both plugs produce a spark at the same time. One of the cylinders will be on the compression stroke and the other on the exhaust stroke, therefore one of the sparks is 'wasted'. The next time the sparks occur, the cylinder strokes will be reversed and the wasted spark will be on the other cylinder.

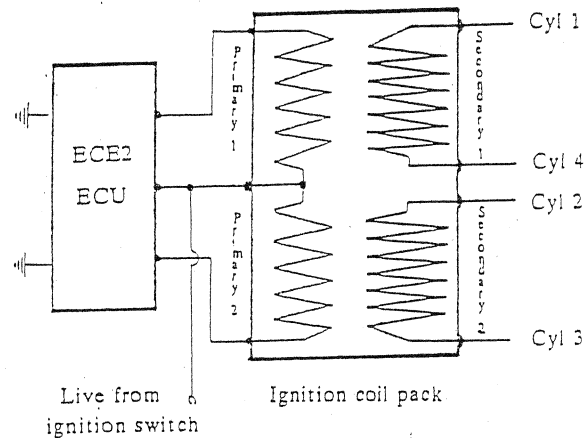


The voltage at the wasted spark is approx 3kV , however on conventional ignition circuits up to 10 kV can be lost through the rotor arm and distributor cap assemblies.

When a wasted spark system is adapted for a four cylinder engine, it is necessary to use two ignition coils, each firing two cylinders. Modern wasted spark systems use electronics to carry out the switching of the coil primary circuit. A crankshaft sensor indicates to the ECU a reference to cylinders 1 and 4. The ECU calculates the position of cylinders 2 and 3.

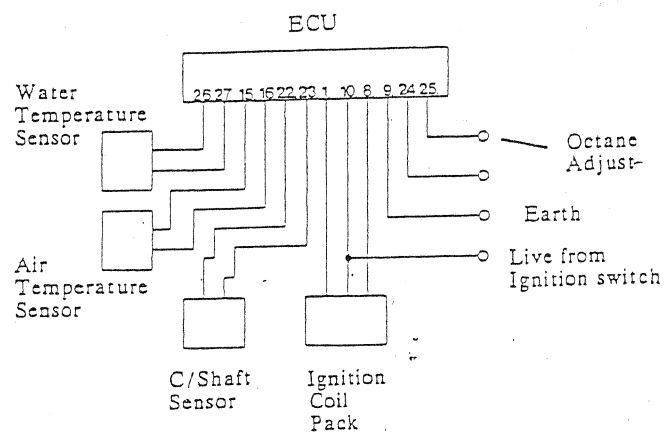


The two coils share a live feed from the ignition switch to the primary windings and the other end of each primary winding is connected to the ECU. The ECU switches the circuit and also provides the correct dwell angle and timing point. The secondary windings are independent.



Sensors provide information to the ECU to enable correct dwell and timing to be calculated. These sensors include :

- (i) Water temperature
- (ii) Engine load
- (iii) Engine speed/crankshaft position (inductive type)
- (iv) Air temperature



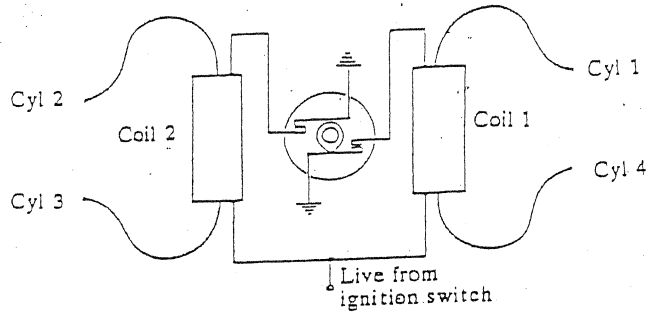
B=Supply voltage from ignition switch

SCHEMATIC WIRING DIAGRAM OF 12 PIN MODULE

Wasted Spark DIS

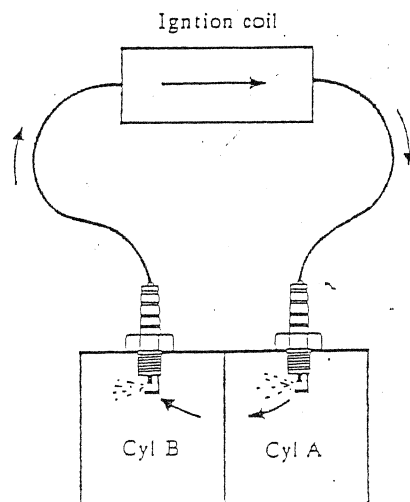
The wasted spark distributorless ignition system utilises one ignition coil to provide a spark to two plugs. This design is only suitable where a pair of pistons rise and fall together, i.e. conventional 4-cylinder engine.

One coil is used to 'fire' plugs 1 and 4 and a second coil is used to 'fire' plugs 2 and 3.

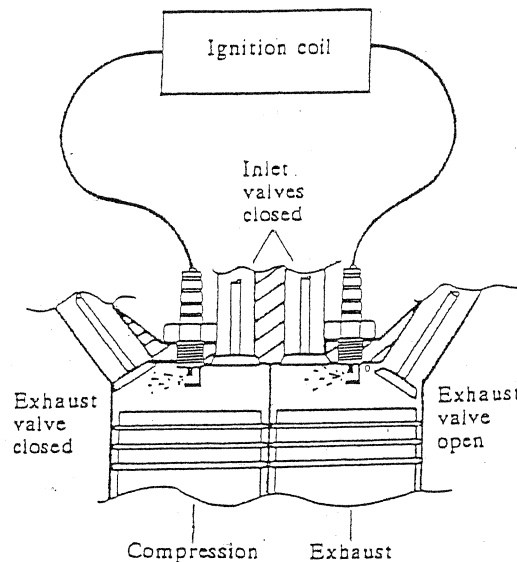


The ignition coil is similar to the conventional coil, there is still a primary and secondary winding. The secondary winding however, is open at both ends, each end connected to a spark plug.

The voltage produced in the secondary winding will pass down the lead to spark plug 'A' and across the plug gap to the engine and the continue through the gap of spark plug 'B', up the lead back to the ignition coil winding.

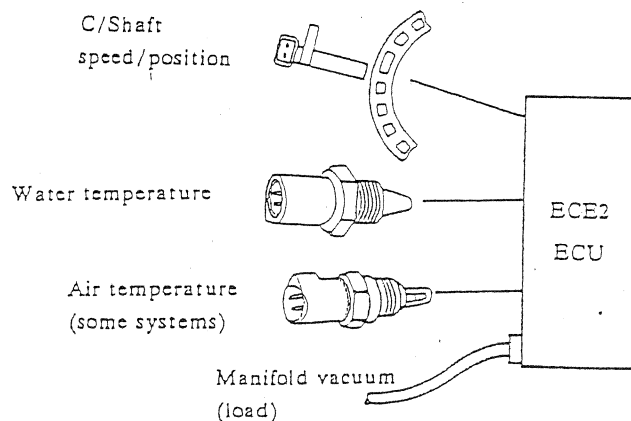


Both plugs produce a spark at the same time. One of the cylinders will be on the compression stroke and the other on the exhaust stroke, therefore one of the sparks is 'wasted'. The next time the sparks occur, the cylinder strokes will be reversed and the wasted spark will be on the other cylinder.

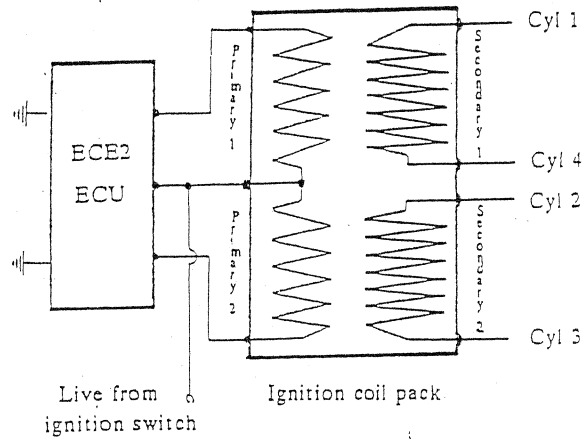


The voltage at the wasted spark is approx 3kV , however on conventional ignition circuits up to 10 kV can be lost through the rotor arm and distributor cap assemblies.

When a wasted spark system is adapted for a four cylinder engine, it is necessary to use two ignition coils, each firing two cylinders. Modern wasted spark systems use electronics to carry out the switching of the coil primary circuit. A crankshaft sensor indicates to the ECU a reference to cylinders 1 and 4. The ECU calculates the position of cylinders 2 and 3.

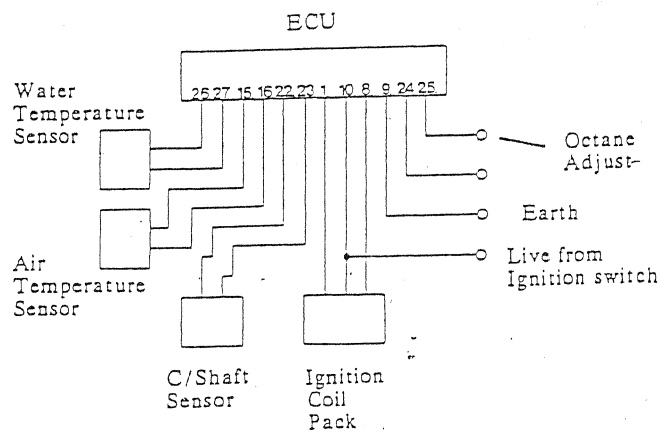


The two coils share a live feed from the ignition switch to the primary windings and the other end of each primary winding is connected to the ECU. The ECU switches the circuit and also provides the correct dwell angle and timing point. The secondary windings are independent.

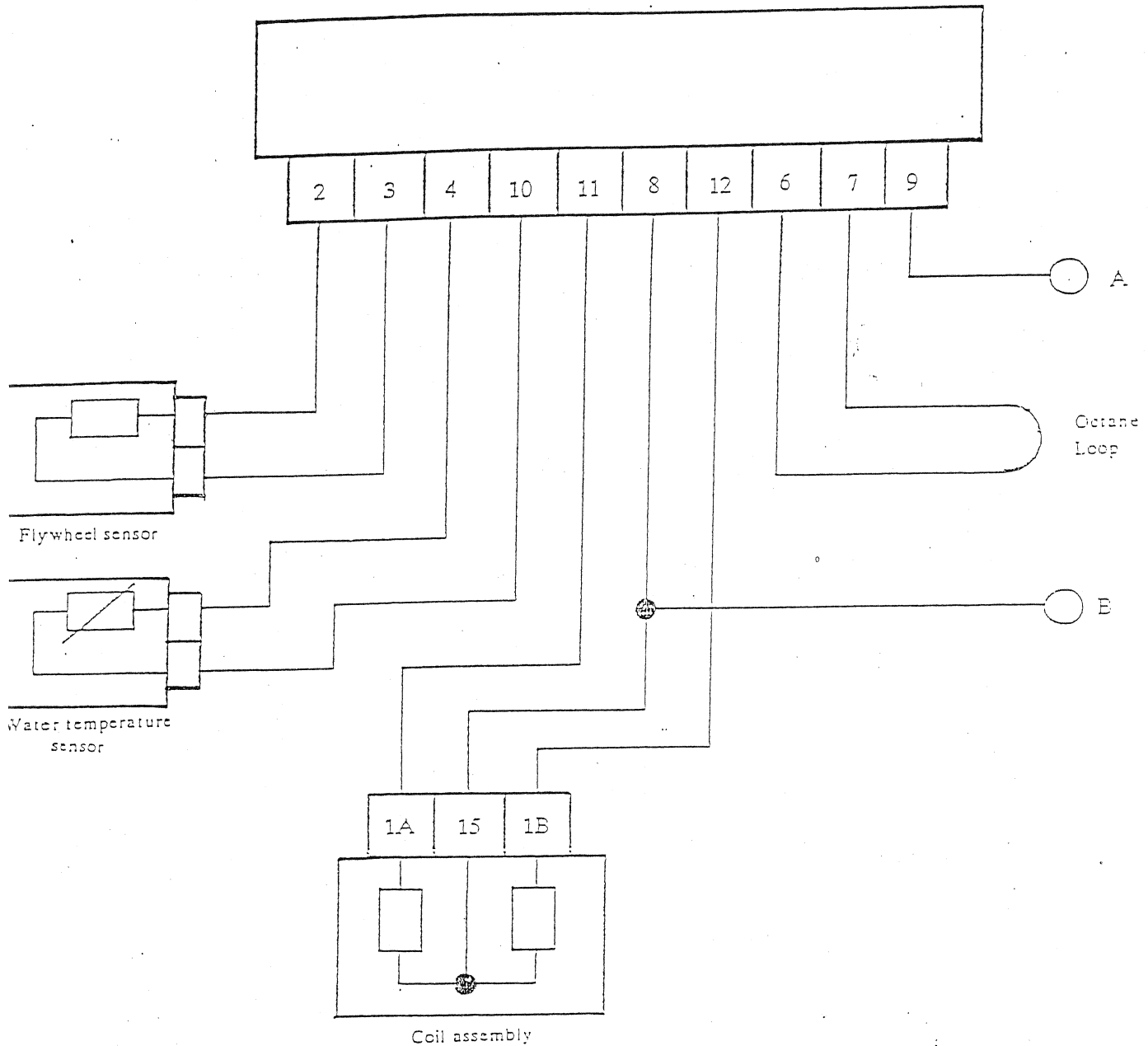


Sensors provide information to the ECU to enable correct dwell and timing to be calculated. These sensors include :

- (i) Water temperature
- (ii) Engine load
- (iii) Engine speed/crankshaft position (inductive type)
- (iv) Air temperature



WIRING DIAGRAMS



A=Earth connection

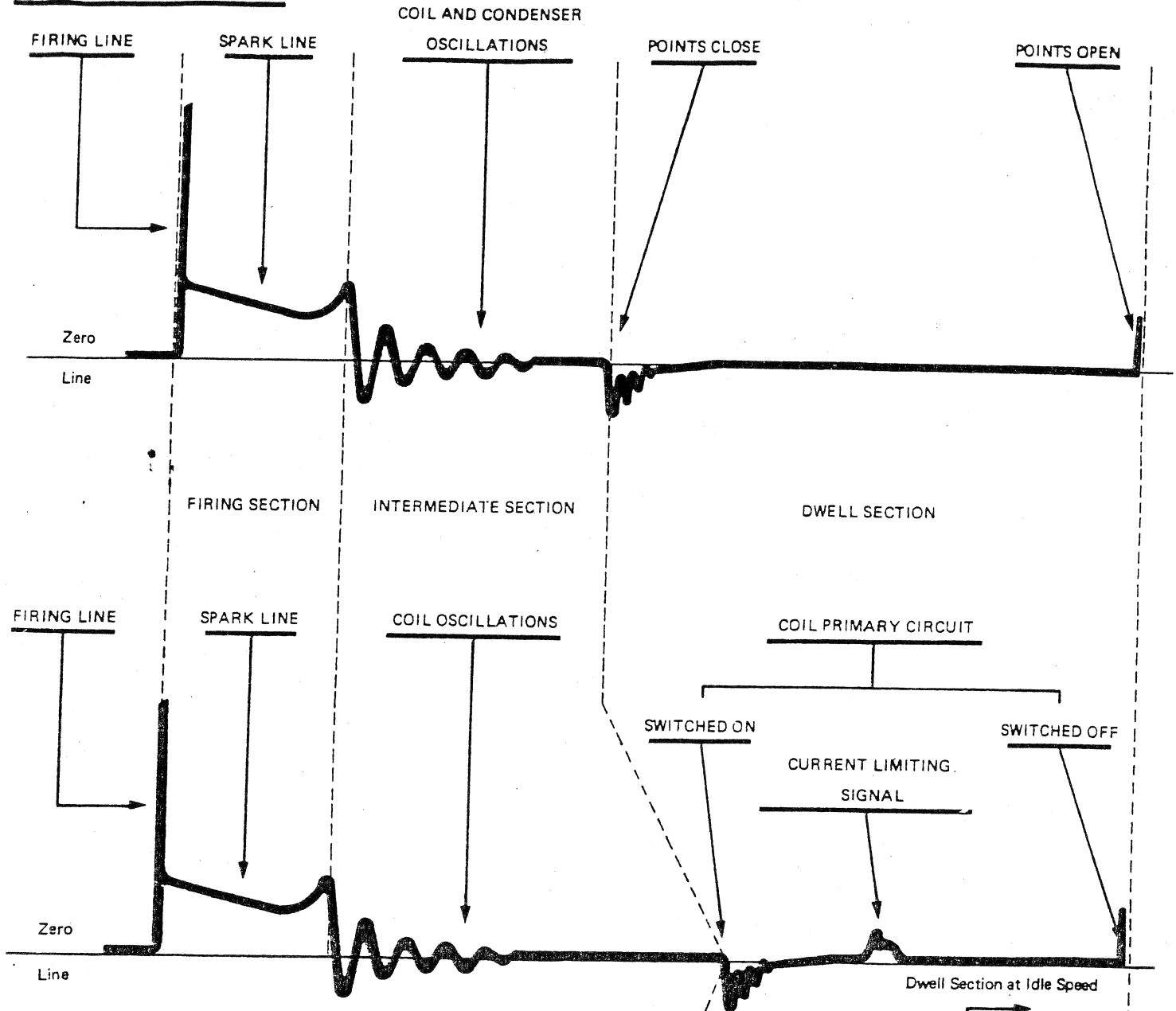
B=Supply voltage from ignition switch

SCHEMATIC WIRING DIAGRAM OF 12 PIN MODULE

Sun Scope Pattern

Conventional System compared with a typical Constant Energy Electronic System
(Secondary Waveforms)

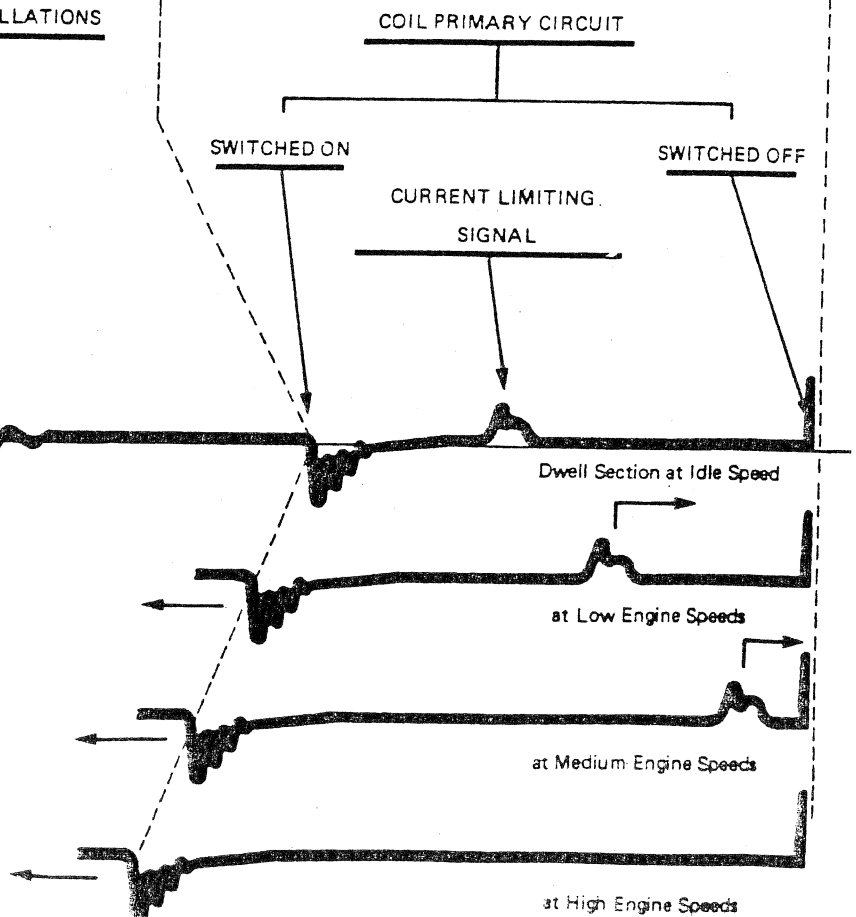
Conventional System

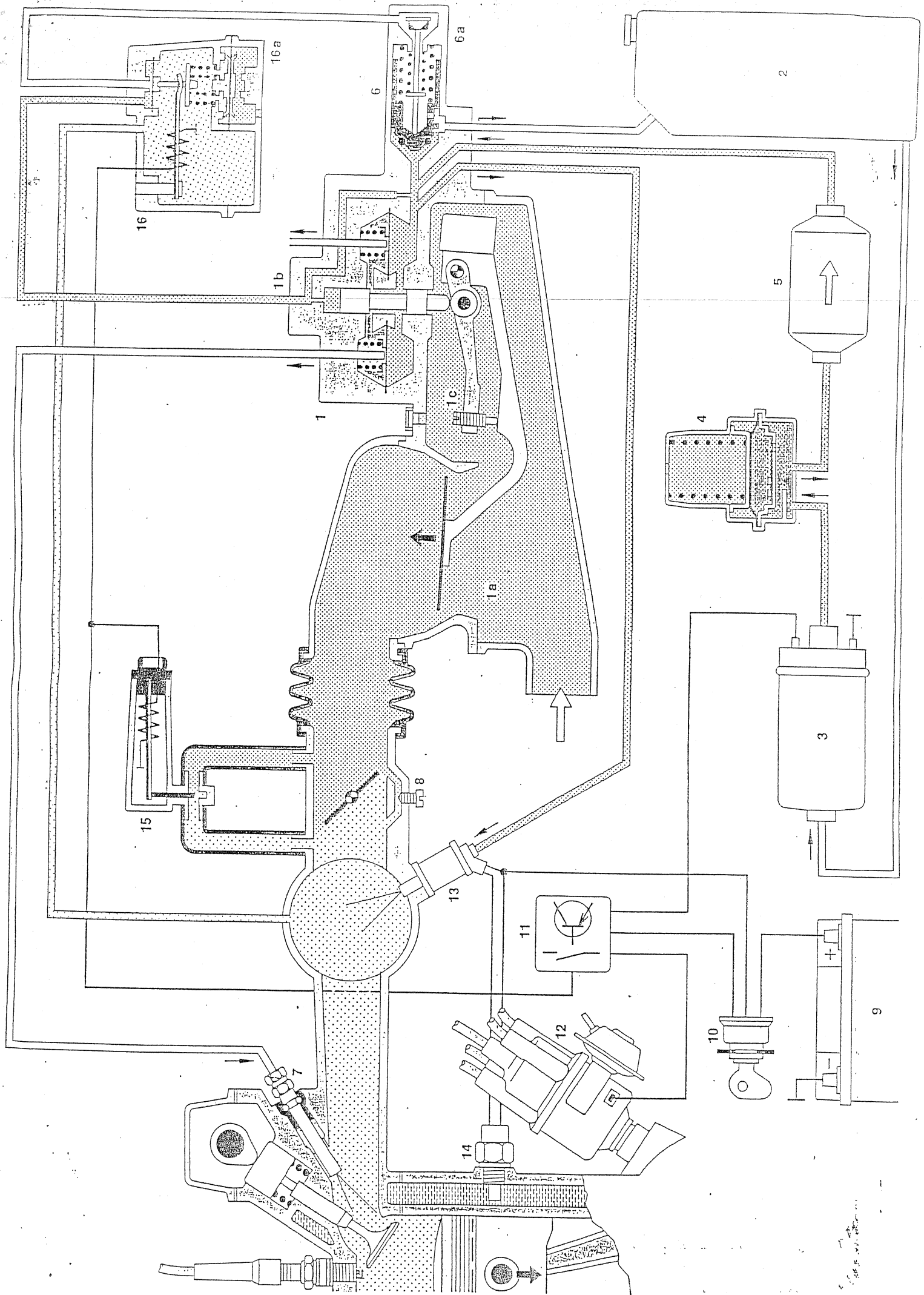


Constant Energy Electronic System

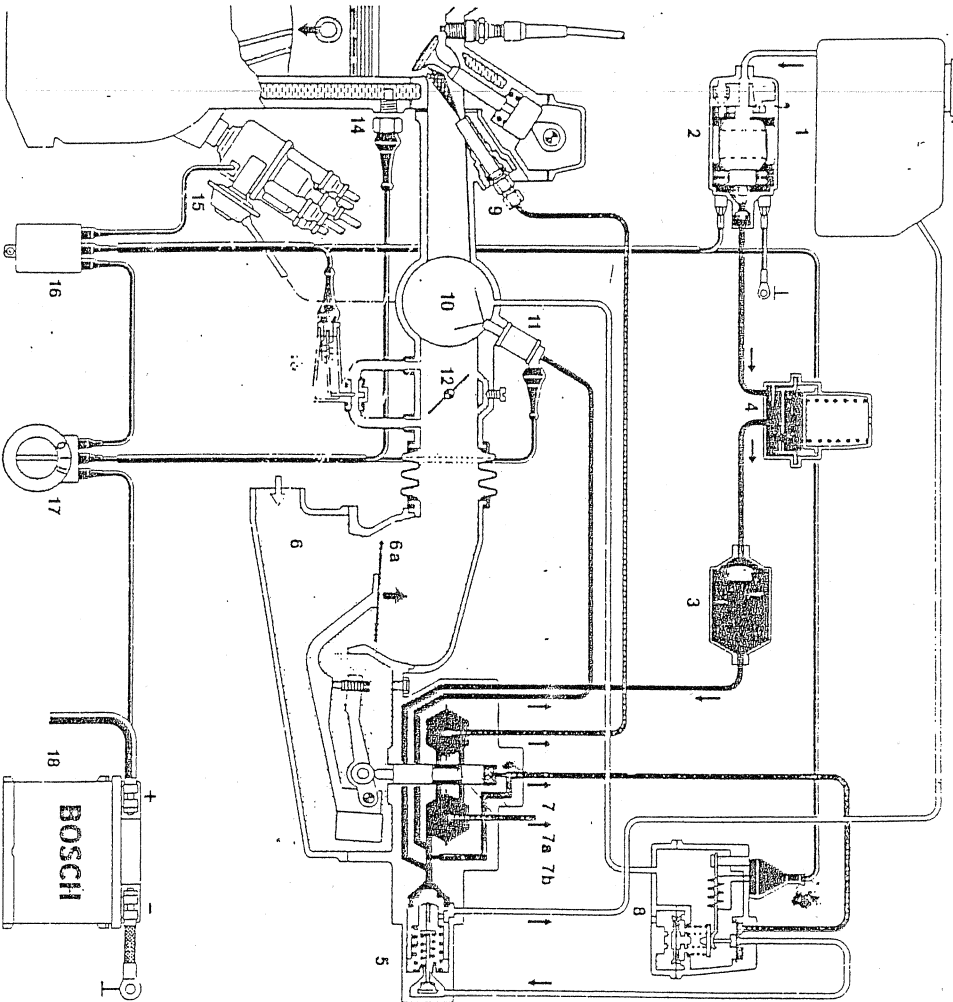
NOTE:

In the Dwell Section of the waveform, the positions of the signals relating to the Coil Primary Circuit switching on and Current Limiting may vary according to the design of the Ignition System and the speed of the engine.





Pressure ratio and components of K-Jetronic



- 1 Fuel tank
- 2 Electric fuel pump
- 3 Fine filter
- 4 Fuel accumulator
- 5 System-pressure regulator
- 6 Air-flow sensor with air-flow sensor plate (6 a)
- 7 Fuel distributor with control plunger (7 a) and its control edge
- 8 Warm-up regulator
- 9 Injection valve
- 10 Intake manifold
- 11 Cold-start valve
- 12 Throttle valve
- 13 Auxiliary-air device
- 14 Thermo-time switch
- 15 Ignition distributor
- 16 Control relay
- 17 Ignition-starter switch
- 18 Battery

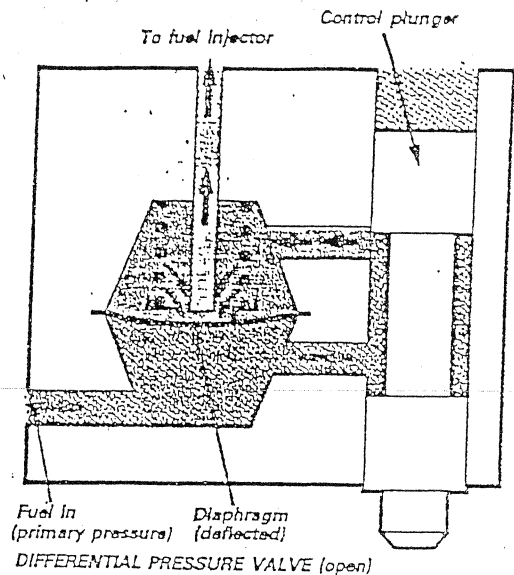
- System pressure
- Injection pressure
- Control pressure
- Suction line resp. return
- Atmospheric pressure
- Pressure in manifold
- Coolant

DIFFERENTIAL PRESSURE VALVES

The mixture control unit also houses the differential pressure valves (one per cylinder or metering barrel slit). The purpose of these is to maintain a constant pressure drop at the metering slit, regardless of the fuel quantity passing through.

Each valve consists of two chambers, separated by a steel diaphragm, loaded to 4.7bar by a spring in the upper chamber. This upper chamber is fed by fuel from the metering slits and, in turn, feeds fuel to the injectors. The lower chambers of each valve are interconnected and subject to primary (pump) pressure.

The differences in pressure which would normally prevail, due to a changing rate of fuel flow, are counteracted by the diaphragm flexing (under spring pressure) and increasing or decreasing the gap between it and the valve seat at the base of the outlet pipe.

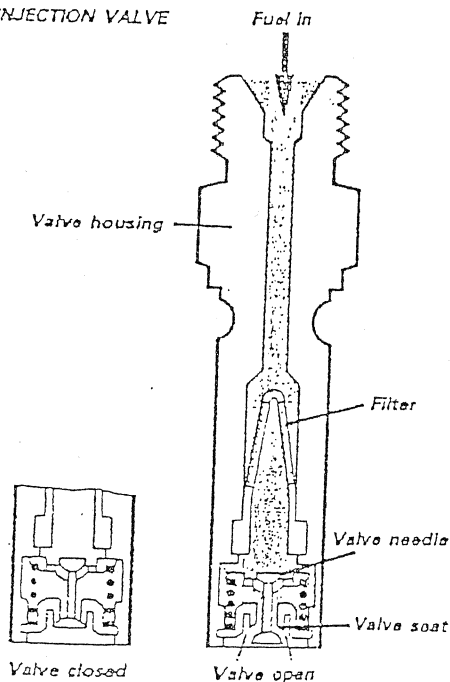


INJECTION VALVES

The injection valves are a push fit into the special holders which insulate them from engine heat. They have no metering function and inject fuel whenever fuel pressure in the delivery pipes from the distributor exceeds 3.3bar.

In use, the valve needle vibrates at a high frequency, ensuring good fuel atomisation even with the smallest of injected quantities. When the engine is switched off, the valves should close tightly, forming a non-drip seal.

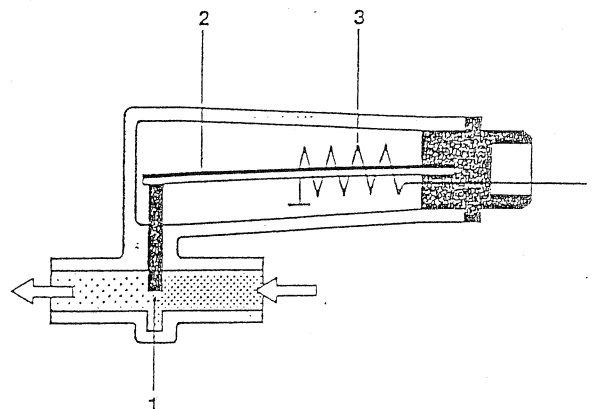
FUEL INJECTION VALVE



AUXILIARY AIR DEVICE

In most carburettor systems the choke mechanism is designed to provide a fast idle until the engine reaches its correct operating temperature. With the K-Jetronic fuel injection layout, the auxiliary air device fulfils a similar role.

The device consists of a sliding disc valve, which opens or closes a by-pass port across the throttle valve. The disc is moved by a bi-metal spring which, when cold, causes the disc to slide into the open position. As the now ingoing air still causes the sensor plate to lift, it results in the engine receiving sufficient air/fuel mixture to provide a steady (fast) idle until the engine warms up and the bi-metal spring closes the disc valve.



- Auxiliary-air device
- 1 Bypass line with pivoting plate
- 2 Bimetal
- 3 Electrical heating

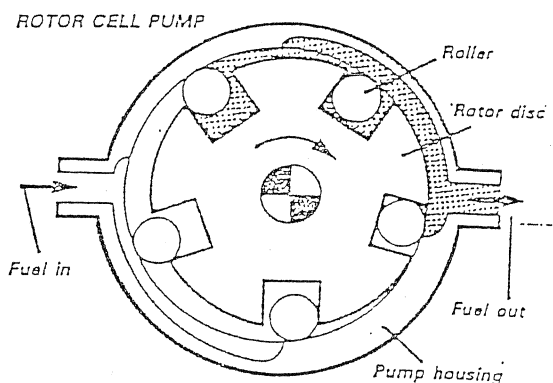
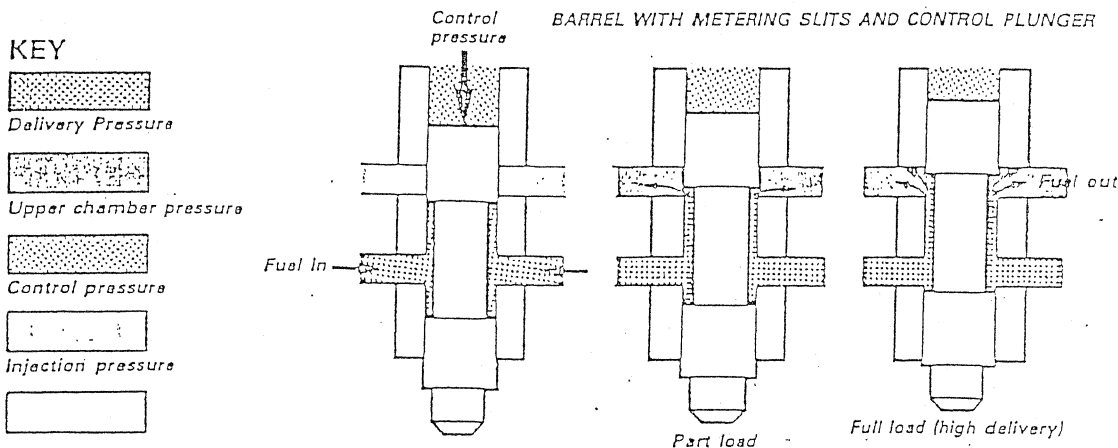
This air flow moves the sensor plate from its zero or rest position, the degree of movement being directly related to the volume, or rather mass, of air drawn in. This, in turn, is dependent upon the throttle valve position; the wider open the throttle, the greater the air flow and increased movement of the sensor plate.

Movement of the sensor plate and its lever is transmitted through the secondary lever to the control plunger. The position of this plunger controls the amount of fuel to be injected.

The barrel in which the plunger operates is produced with a number of vertical slits in the upper part of its body. These slits are covered by the plunger when the sensor plate is in its zero (rest) position and then

progressively uncovered as the sensor plate moves the plunger upwards. As shown in the diagram below, upward movement of the plunger allows an ever increasing amount of fuel to flow through the uncovered slits to the differential pressure valves and on to the injectors.

The quantity of fuel injected is therefore directly related to the position of the sensor which, in turn, is dependent on air flow.



ELECTRIC FUEL PUMP

The permanent magnet type motor drives a rotor cell pump in which an offset rotor with metal rollers in grooves around its circumference turns within a circular housing. Centrifugal force causes the rollers to move out against the housing and act as seals. The fuel is carried in the cavities between the rotor and housing which, in effect, decrease as the rotor turns, pumping fuel out through a one-way valve to the accumulator.

The pump motor is surrounded by fuel and new assemblies are supplied full of a fuel/preservative mixture. Do not, at any time, allow the pump to run dry — it will ruin the roller to housing seals.

The only repair to a pump is replacement of the one-way valve. Any other defect in the pump itself will necessitate a new unit.

FUEL FILTER

The fuel filter acts much like its counterpart in an ordinary carburettor system, only much more so. Closer tolerances in the fuel injection equipment require much finer filtration of the fuel — the slits in the fuel distributor barrel, for instance, are only about 0.2mm (0.004in) wide.

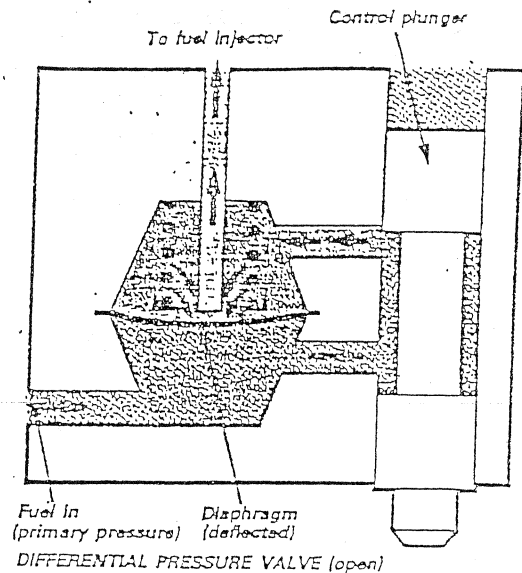
Fuel flow through the filter is only one way. Therefore, it's essential to ensure that any replacement is fitted the right way.

DIFFERENTIAL PRESSURE VALVES

The mixture control unit also houses the differential pressure valves (one per cylinder or metering barrel slit). The purpose of these is to maintain a constant pressure drop at the metering slit, regardless of the fuel quantity passing through.

Each valve consists of two chambers, separated by a steel diaphragm, loaded to 4.7bar by a spring in the upper chamber. This upper chamber is fed by fuel from the metering slits and, in turn, feeds fuel to the injectors. The lower chambers of each valve are interconnected and subject to primary (pump) pressure.

The differences in pressure which would normally prevail, due to a changing rate of fuel flow, are counteracted by the diaphragm flexing (under spring pressure) and increasing or decreasing the gap between it and the valve seat at the base of the outlet pipe.

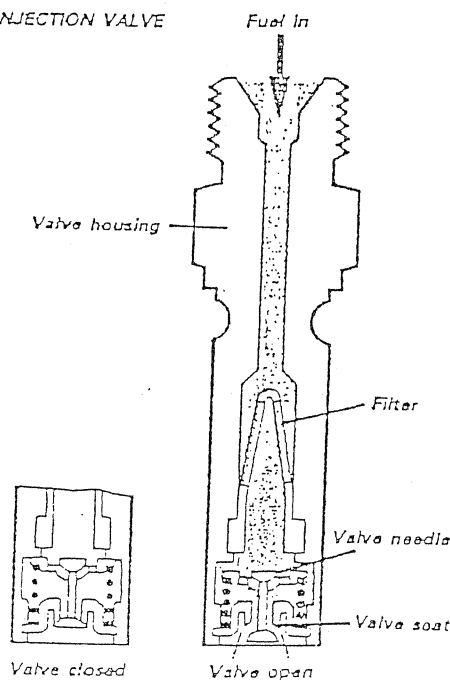


INJECTION VALVES

The injection valves are a push fit into the special holders which insulate them from engine heat. They have no metering function and inject fuel whenever fuel pressure in the delivery pipes from the distributor exceeds 3.3bar.

In use, the valve needle vibrates at a high frequency, ensuring good fuel atomisation even with the smallest of injected quantities. When the engine is switched off, the valves should close tightly, forming a non-drip seal.

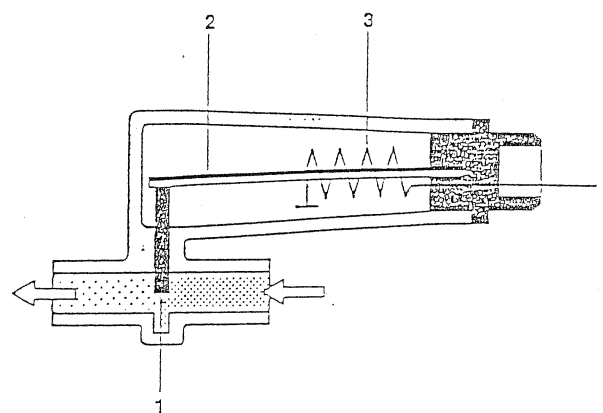
FUEL INJECTION VALVE



AUXILIARY AIR DEVICE

In most carburettor systems the choke mechanism is designed to provide a fast idle until the engine reaches its correct operating temperature. With the K-Jetronic fuel injection layout, the auxiliary air device fulfils a similar role.

The device consists of a sliding disc valve, which opens or closes a by-pass port across the throttle valve. The disc is moved by a bi-metal spring which, when cold, causes the disc to slide into the open position. As the now ingoing air still causes the sensor plate to lift, it results in the engine receiving sufficient air/fuel mixture to provide a steady (fast) idle until the engine warms up and the bi-metal spring closes the disc valve.



- Auxiliary-air device
- 1 Bypass line with pivoting plate
 - 2 Bi-metal
 - 3 Electrical heating

COLD START VALVES

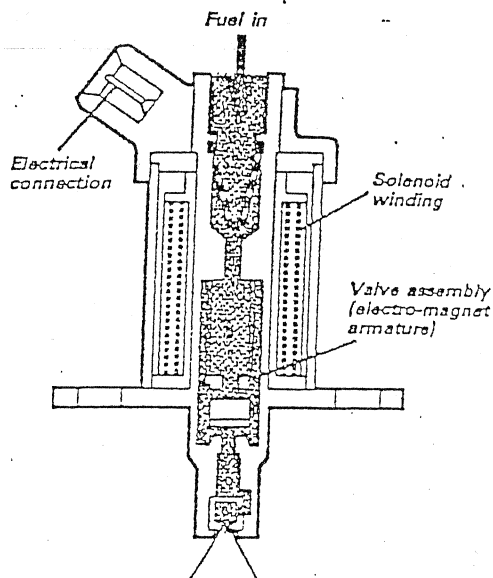
In cold start conditions, part of the injected fuel is lost, due to condensation on the cold cylinder walls. The cold start valve, working in conjunction with the thermo-time switch, compensates for this by supplying extra fuel.

The valve itself is of the solenoid operated type, opening when supplied with an electrical current from the thermo-time switch. This switch consists of a bi-metal strip operating a couple of contacts. When cold, these contacts are closed, allowing

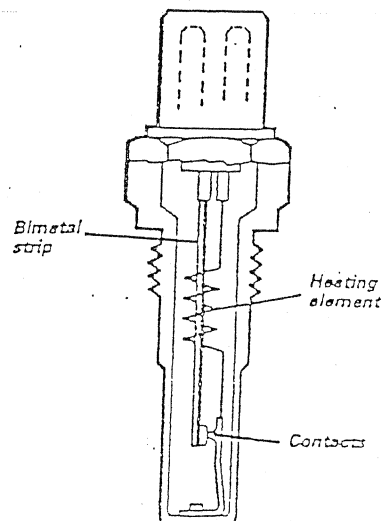
current to pass from the ignition switch to the cold start valve.

As the engine warms up, the bi-metal strip opens the contacts and the cold start valve closes. To avoid flooding the engine, a heating element is incorporated into the thermo-time switch, causing the contacts to open after a set time. At -20 degrees C, this would be approximately eight seconds.

The valve nozzle is designed to give the ingoing fuel a swirl action, so as to provide good atomisation.

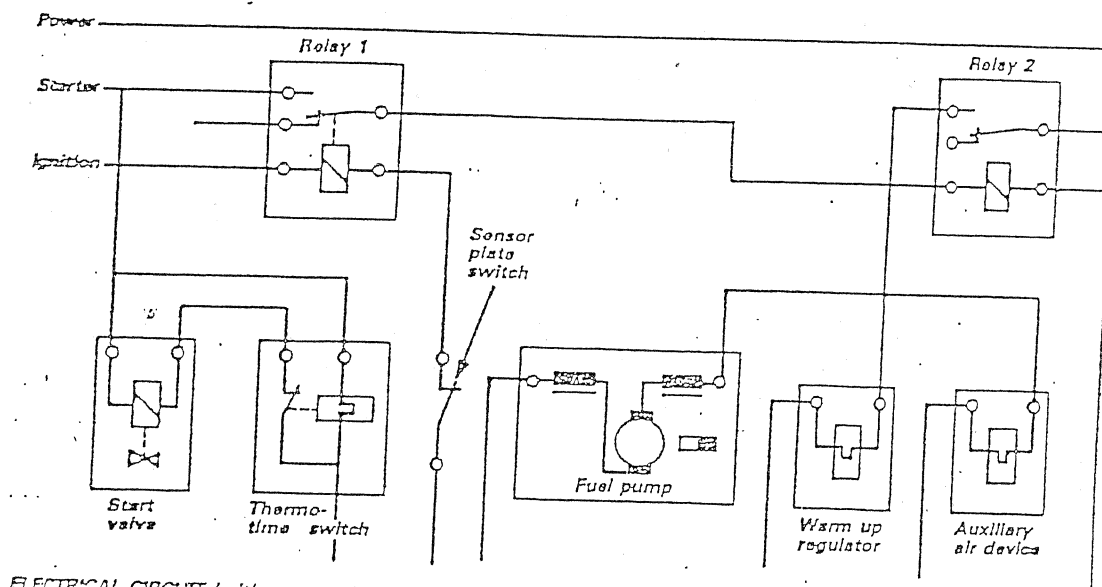


COLD START VALVE (operating)



THERMO-TIME SWITCH

ELECTRICS



ELECTRICAL CIRCUIT (with sensor plate switch)

Any fuel system using an electrically operated pump should have some safety device, whereby the pump will only operate when the engine is running. This would ensure that, in the event of an accident or ruptured fuel line, the pump would stop when the engine did.

Strictly speaking, this safety device is not part of the fuel injection system, for it is included in the cars wiring layout. As such, it can vary from model to model. The majority, however, now use a relay which is switched on electronically by a pulse

PETROL FUEL SYSTEM

Air-Fuel Ratio

The chemically correct air-fuel for theoretical complete combustion is 15 parts air to 1 part petrol (by mass). This ratio of 15:1 is sometimes referred to as the stoichiometric ratio. More air or less petrol gives a weak mixture (e.g. 20:1).

Less air or more petrol gives a rich mixture (e.g. 10:1)

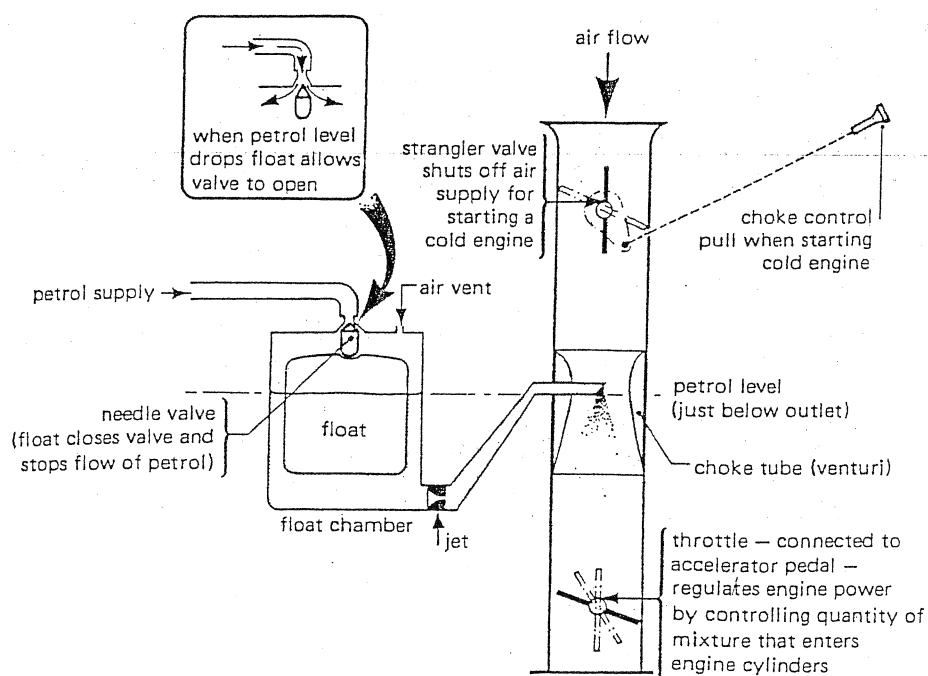
Carburettor

The function of a carburettor is to meter the correct air-fuel ratio and to atomise the fuel into fine particles to assist in combustion.

Simple Carburettor

The carburettor consists of two main points:

1. Float chamber - to regulate the flow of petrol to the carburettor and to maintain the petrol at a level just below the jet outlet.
2. Mixing chamber - to mix the fuel and air in the correct proportion and also to atomise the fuel.



Layout of simple carburettor

Opening the throttle of the carburettor causes the air flow through the carburettor to increase; this intensifies the depression in the choke tube and allows more fuel to flow from the float chamber to mix with this extra air. Unfortunately the petrol flow increases at a greater rate than the air supply.

The mixture supplied by a simple carburettor gets richer as the speed is increased.

To overcome this problem a correction or compensation system is necessary.

Cold Starting

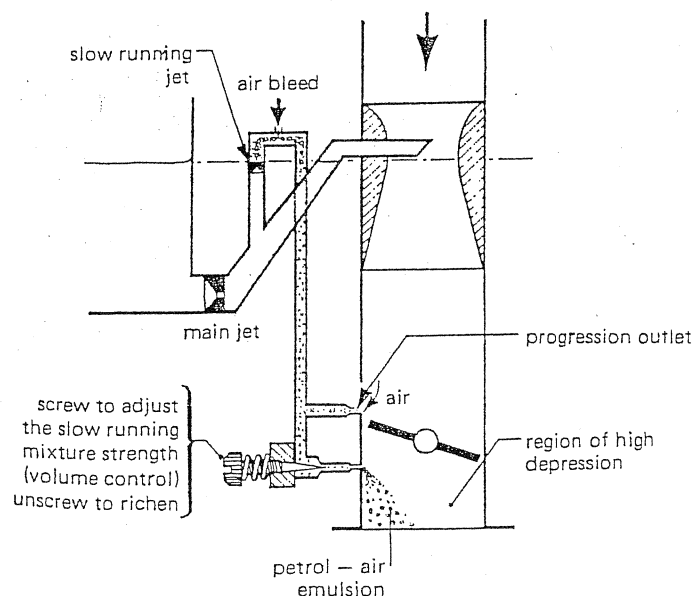
A carburettor set to give a mixture strength of 15:1 at a normal engine speed would be unsuitable for starting a cold engine. This is because:

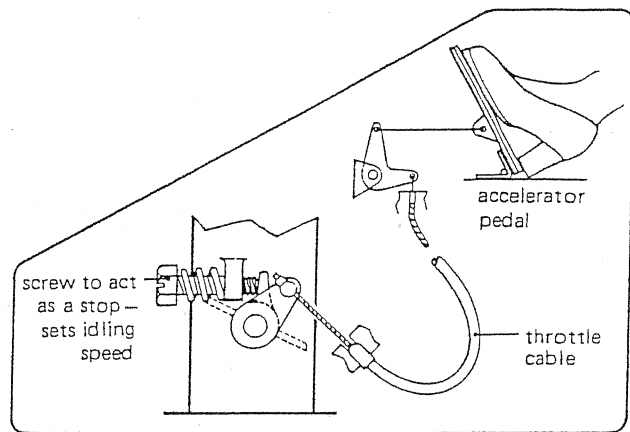
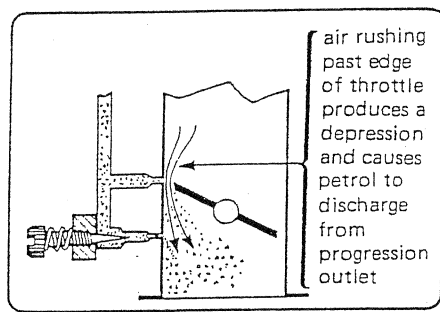
1. The cold engine will not vaporise the fuel.
2. The slow cranking speed only gives a small depression and this causes the carburettor to supply a very weak mixture.
3. Petrol falls out of the slow moving air and is deposited in the walls of the induction pipe.

Shutting off the air by means of a strangler (or choke) valve gives a rich mixture (8:1) and provides the engine with a sufficient number of fuel particles to vaporise easily.

Slow Running

The small amount of air passing through the carburettor when the engine is slow running produces a very small choke depression. This means that too little fuel will be supplied and the engine will stall.





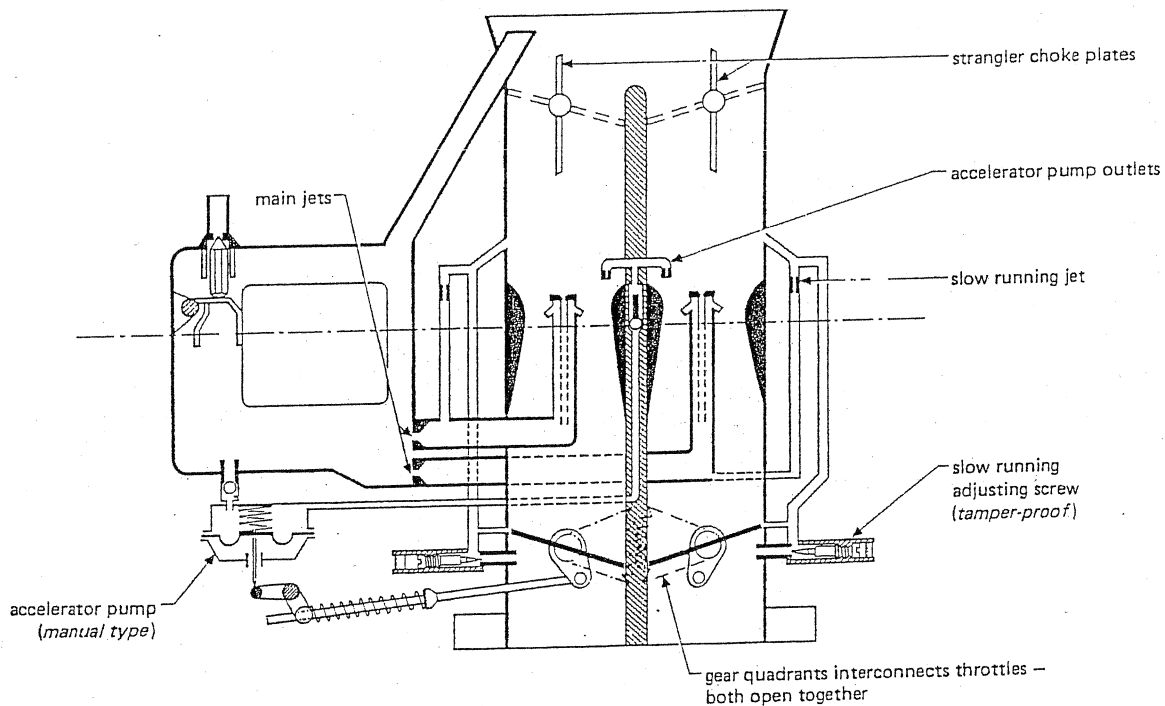
The slow running system has an outlet in a region where a high depression exists when the engine is idling.

To obtain a smooth transfer as the engine speed is increased, extra holes are drilled adjacent to the edge of the throttle disc: these holes are the progression outlets.

The adjusting screws control the slow running system; one screw sets the idle speed the other enables the slow running mixture to be varied to give the smoothest engine speed.

Twin-choke Carburettor

Engines such as the V6 and V8 normally require two carburettors. Cost and space are saved when the two carburettors are joined together to share a common float chamber.



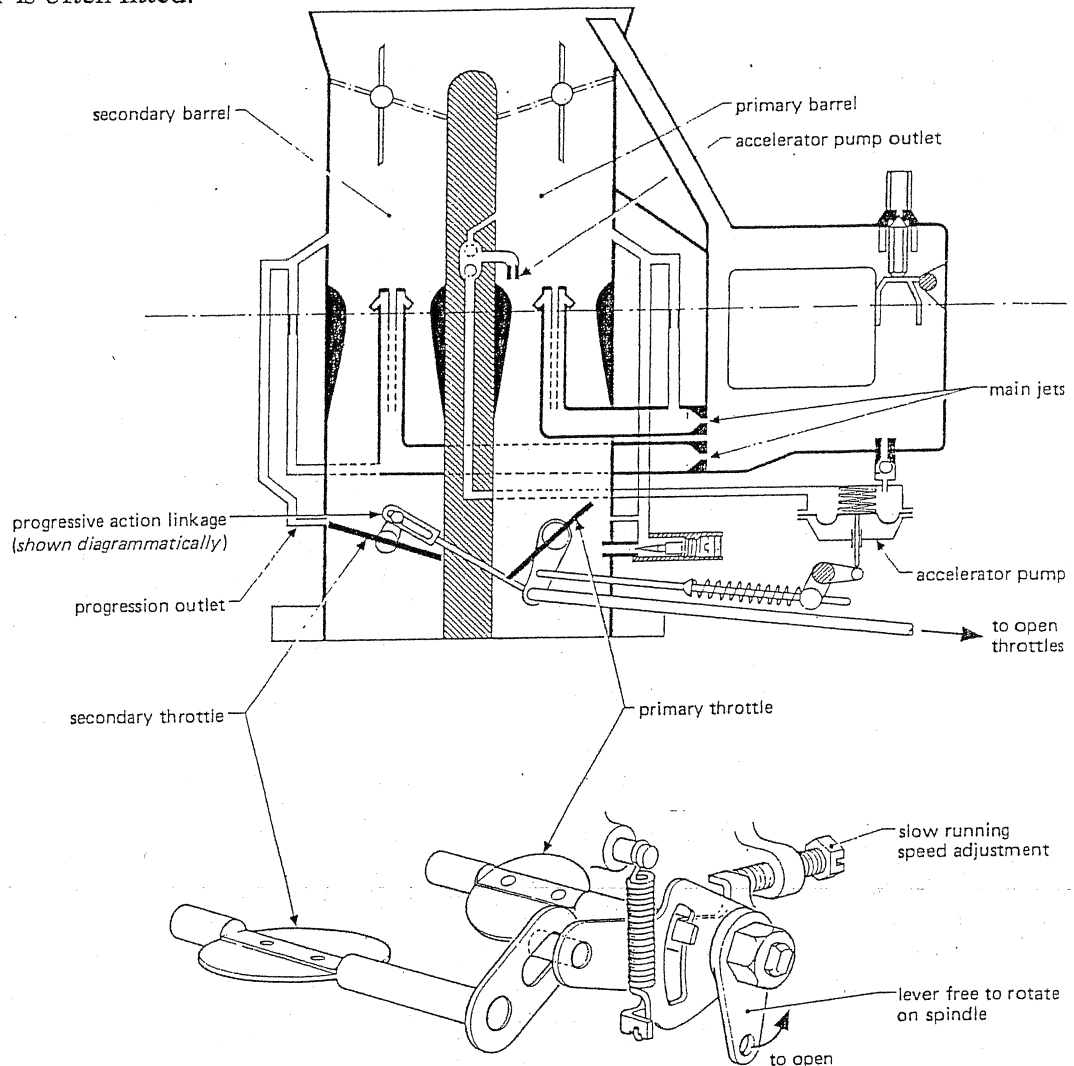
Twin-choke carburetter

The diagram shows a dual-venturi downdraught carburettor. Normal practice is to arrange the manifold so that one venturi system supplies one set of cylinders and the other venturi the remaining cylinders. This layout identifies why each venturi needs to be provided with its own system for cold starting, slow-running, cruising and power. The two throttle valves are interconnected and should be synchronised to give the same opening at all engine speeds.

Twin-barrel Sequential Carburettor

To obtain fuel economy, a good atomisation of the fuel is needed. In a fixed-choke carburettor this can be achieved by using a comparatively small diameter venturi. Unfortunately the restriction to air flow of a small venturi gives poor volumetric efficiency and results in low maximum power.

When both economy and high maximum power are required, a multi-barrel sequential type carburettor is often fitted.



The two throttle valves are coupled together in such a way that the secondary throttle remains closed until the primary throttle has opened about two-thirds. When the throttle opens past this point, the linkage moves the secondary throttle so that both throttles reach the full open position together.

This sequential movement allows the primary barrel to supply all cylinders with a slightly weak, well atomised mixture for cruising conditions.

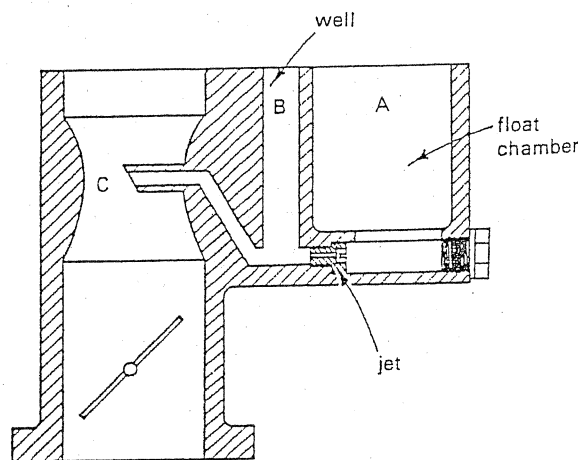
When power is required, the second barrel provides extra fuel and a good supply of air to meet power demands.

Mixture Correction

A corrected jet or carburettor is one which supplies a constant air/fuel ratio at all engine speeds. One which supplies a mixture which becomes richer as air flow increases is uncorrected or under-corrected, whilst one which supplies a mixture which becomes weaker as air flows is over-corrected.

Over-correction

In the arrangement below both sides of the jet are open to atmospheric pressure. With the engine stationary and the fuel supply turned on, fuel will fill the float chamber to a level determined by the float mechanism. It will also flow through the jet and fill both the well and the discharge tube to the same level, since when the engine is not running the pressures at A, B and C are equal (atmospheric pressure).



An over-corrected carburettor

If the engine is now started and set to run slowly, the pressure at C will fall according to the rate of flow through the choke tube. This will result in a fall in the level of the fuel in the well B proportional to the pressure difference between B and C. The fuel drawn from the well issues from the discharge tube and mixes with the air drawn through the choke tube to form the mixture delivered to the engine.

There is now a difference in level between the fuel in the well and the fuel in the float chamber; this will cause fuel to flow through the jet at a rate determined by the size of the jet and the difference in level between A and B

Fuel will be drawn away at C at the same rate as it passes through the jet, thus keeping the level B constant so long as the pressure at C remains constant.

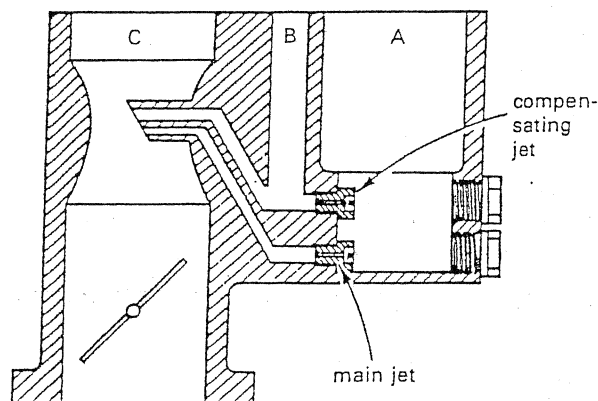
As engine speed is increased the air flow through the choke is increased, lowering the pressure at C, thus in turn lowering the level in B and consequently increasing the flow through the jet.

A very small pressure drop at C will empty the well to the level where the discharge tube leads off and thereafter the difference in level between A and B cannot be increased any more. This condition will occur at quite a low engine speed and produced the maximum possible flow of fuel through the jet, so that any further increase in engine speed, while decreasing the pressure at C, cannot increase the fuel flow.

Increase in engine speed now results in a weakening of the mixture, since air-flow increases without corresponding increase in fuel flow, giving the characteristics of an over-corrected jet.

Compound Jet

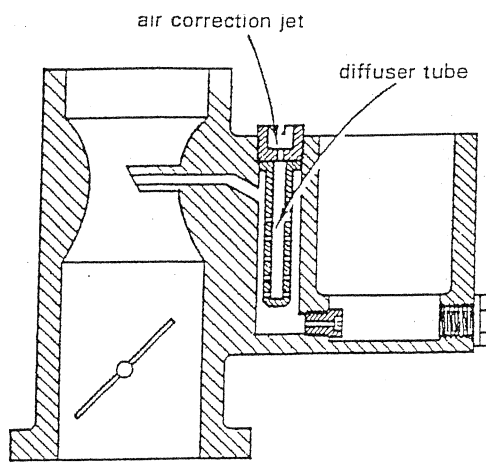
The diagram below shows a carburettor using two jets. The main jet is a simple uncorrected jet, whilst the compensating jet is of the over corrected type. Selection of the main and compensating jet sizes can match up in such way that the richening mixture delivered by the main jet is exactly balanced by the weakening mixture supplied by the compensation jet.



The compound jet arrangement

Air Bleed

The air correction jet forms the opening of the well to atmosphere and is screwed into the top of a diffuser tube dipping into the fuel in the well. The lower end of this tube is drilled with a number of small holes through which air is bled into the fuel. The air forms an emulsion of tiny bubbles of air in the liquid fuel, so assisting with the atomisation of the fuel when it enters the mixing chamber.



An air-bleed system

Economisers

Motor vehicle engines spend little of their lives at full throttle. Generally low fuel consumption is considered of great importance. It is therefore necessary to set the carburettor to provide the best mixture for economy when the throttle is not fully opened, but to richen the mixture, for maximum power, for full-throttle operation.

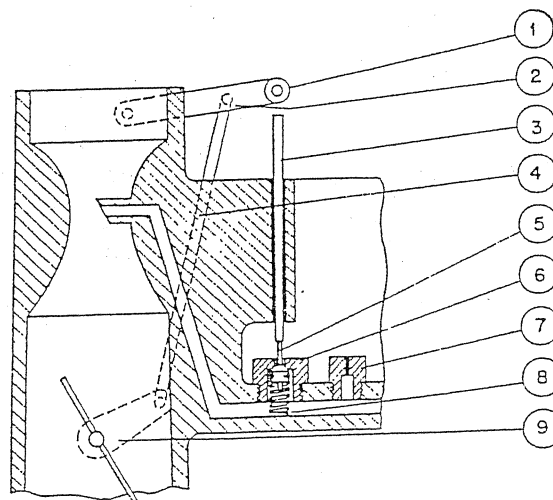
Many carburettor are fitted with means for enriching the mixture when the throttle approaches the fully open position, thus permitting the use of economy mixture at part throttle. Arrangement of this kind are called economisers, enrichment devices or power jets.

The diagram below shows an enrichment jet which is brought into operation by a mechanical connection to the throttle. The mixture for part throttle is supplied by the main jet (7).

Alongside this is the enrichment jet (6) which is closed by the valve (5) being pushed by the spring (8) so that the coned head of the valve seats in the orifice of the jet.

A lever (9) attached to the throttle spindle is connected by a link (4) to a second lever (2) on the end of which is a roller (1).

As the throttle approaches the fully open position, the link (4) pulls down lever (2) until the roller (1) touches the end of the rod (3), after which further opening of the throttle opens the enrichment jet.



Enrichment jet operated by throttle linkage

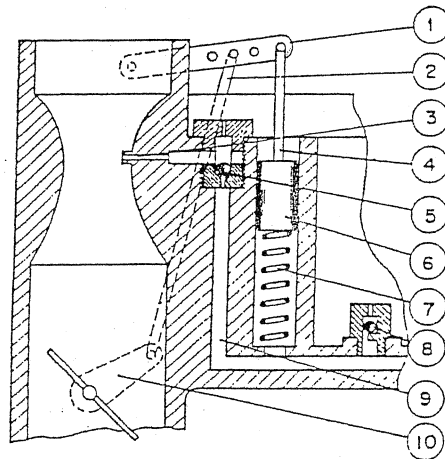
Acceleration

For best acceleration the mixture which reaches the cylinders should be slightly rich which gives maximum power. Whatever mixture the carburettor is adjusted to deliver under steady conditions, the effect of suddenly opening the throttle is an immediate weakening of the mixture reaching the cylinders.

The main reason for this is the greater inertia of petrol compared with air, which prevents the flow of fuel increasing as rapidly as the air flow increases, so that the mixture is weaker than that normally provided until steady conditions are again reached.

This is overcome by fitting an acceleration pump which delivers an additional controlled amount of fuel to the mixing chamber when the throttle is opened.

The diagram below illustrates an acceleration pump mechanically linked to the throttle. When the throttle is opened, the lever (10) pulls down the link (2) and lever (1), thus causing the pump rod (4) to push down the plunger (6).



Mechanically operated acceleration pump

The reverse action takes place as the throttle is closed, the fuel plunger being pushed up by the spring (7), causing fuel to enter the pump cylinder from the float chamber through the non-return valve (8), the ball-valve (5) closing onto its lower seat.

Gradual opening of the throttle causes the plunger (6) to be moved slowly down the cylinder and the non-return valve (8) closes to prevent the return of fuel to the float chamber.

During slow downward movement of the plunger, a large proportion of the fuel will leak past the plunger back to the float chamber and the fuel which is pumped up the passage (9) is moving so slowly that it merely lifts the ball-valve (5) off its lower seating, leaving the upper hole open. This allows a good deal of the fuel passing the ball-valve (5) to

return to the float chamber through the upper hole and very little fuel is ejected from the pump jet.

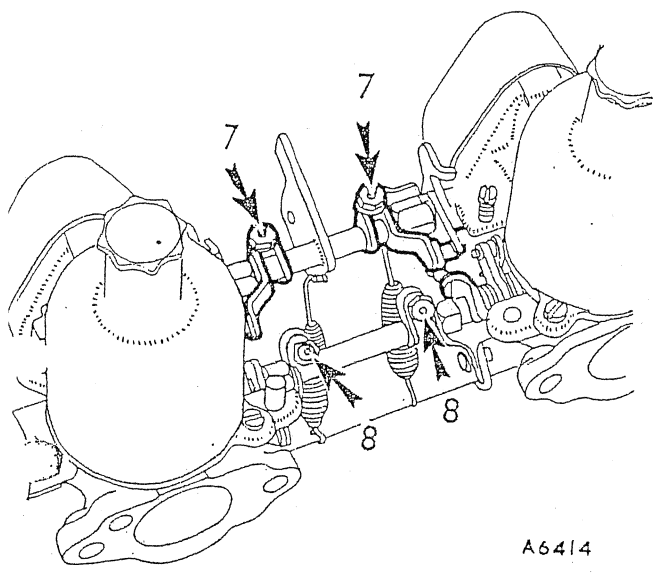
Rapid opening of the throttle displaces fuel from the pump more quickly so that less fuel leaks past the plunger in the shorter time available. More fuel is pumped more quickly up the passage (9) causing the ball-valve (5) to be lifted to its upper seating where it closes the hole at the top of the valve body, preventing the return of fuel to the float chamber. Thus nearly all the fuel displaced by the pump is ejected into the air stream

The main function of the hole at the top of the valve body is to vent the pump jet to the top of the float chamber when the pump is not being operated, thus preventing the fuel being drawn through the accelerating pump by the depression in the choke tube at steady speeds.

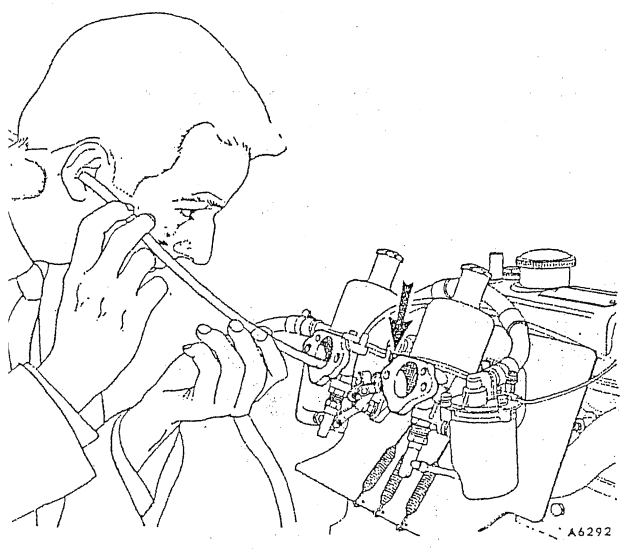
The quantity of fuel delivered can be varied by fitting the upper end of the link (2) into a different hole in the lever (1), thus altering the plunger stroke.

TUNING Multi-carburettors

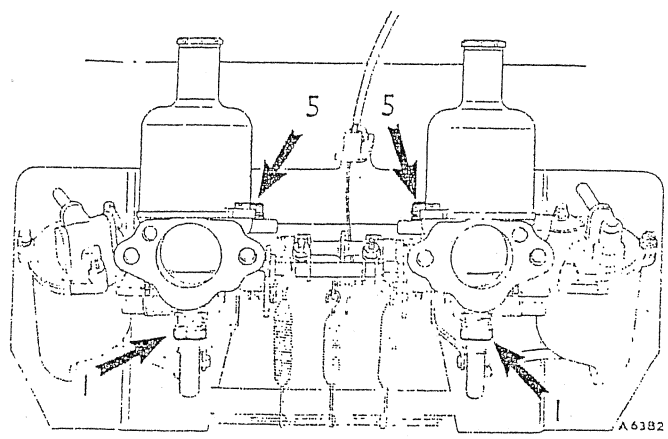
Remove the air cleaners and carry out item 1 as for single carburetters then:



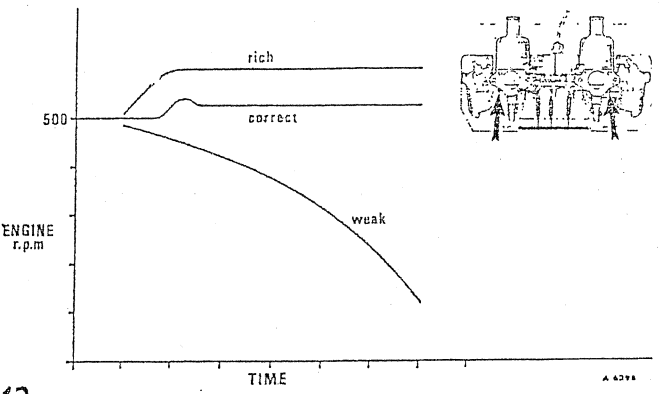
Slacken both of the clamping bolts (7) on the throttle spindle interconnections.
Disconnect the jet control interconnection by slackening the clamping bolts (8).
Carry out items 2 and 3 as for single carburetters, then additionally:



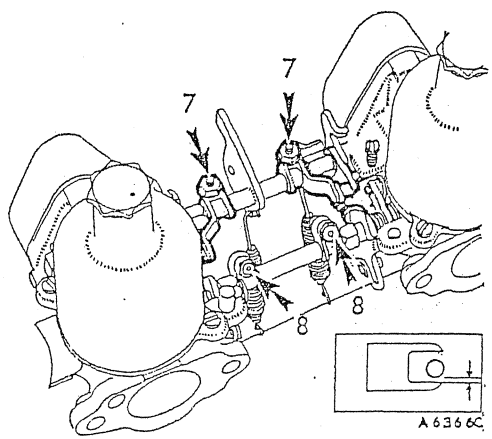
Restart the engine and adjust the throttle adjusting screws on each carburetter to give the desired idling speed as indicated by the glow of the Ignition warning light.
Compare the intensity of the intake 'hiss' on all carburetters and alter the throttle adjusting screws until the 'hiss' is the same.



- 11
 - A. Turn the jet adjusting nuts (1) on all carburetters up to weaken or down to richen the same amount until the fastest idling speed consistent with even running is obtained.
 - B. Readjust the throttle adjusting screws (5) to give correct idling if necessary.

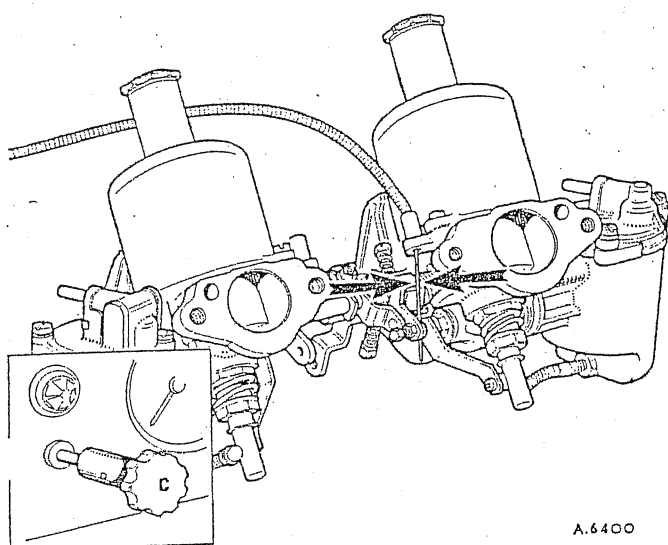


- 12
 - A. Check for correct mixture by gently pushing the lifting pin of the front carburetter up 1/8 in. (·8 mm.) after free movement has been taken up. The graph illustrates the possible effect on engine r.p.m. Readjust the mixture strength if necessary.
 - B. Repeat the operation on the other carburetters and after adjustment re-check since they are all inter-dependent.
 - C. Item 5 shows the correct type of exhaust smoke.



- 13
 - A. Set the throttle interconnection clamping levers (7) so that the link pin is .006 in. (·15 mm.) away from the lower edge of the fork (see inset). Tighten the clamp bolts.
 - B. With both jet levers at their lowest position, set the Jet interconnection lever clamp bolts (8) so that both jets commence to move simultaneously.

TUNING Multi-carburettors (continued)



A.6400

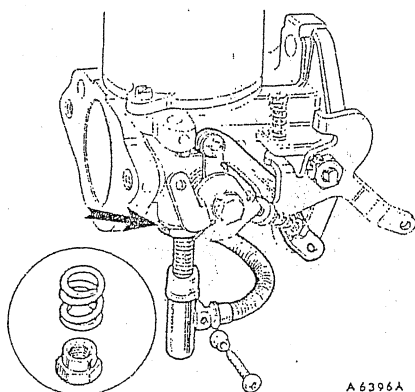
14

- Reconnect the mixture control wire with about $\frac{1}{8}$ in. (1.6 mm.) free movement before it starts to pull on the jet levers.
- Pull the mixture control knob until the linkage is about to move the carburettor jets, and adjust the fast idle screws, comparing the intensity of the air intake 'hiss' to give an engine speed of about 1,000 r.p.m. when hot.
- Refit the air cleaners and re-check for correct mixture as described in item 12.

ADJUSTING AND SERVICING Jet Centring

15

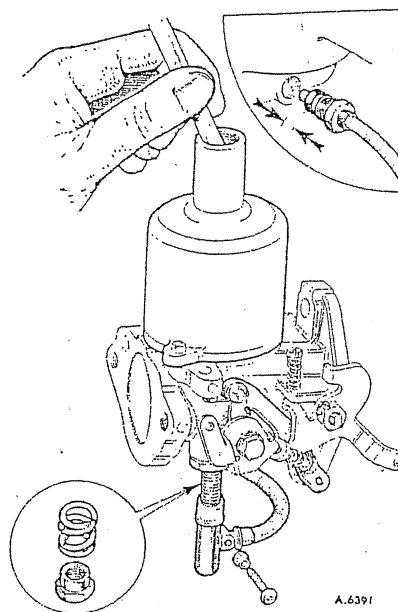
The piston should fall freely onto the carburettor bridge with a click when the lifting pin is released with the jet in the fully up position. If it will only do this with the jet lowered then the jet unit requires re-centring. This is done as follows:



A.6396A

16

- Remove the jet head screw to release the control linkage.
- Withdraw the jet, disconnecting the fuel feed pipe union in the float-chamber, and removing the rubber sealing washer. Remove the jet locking spring and adjusting nut.
- Replace the jet and insert the fuel feed pipe connection into the float-chamber.
- Slacken the jet locking nut until the assembly is free to rotate.

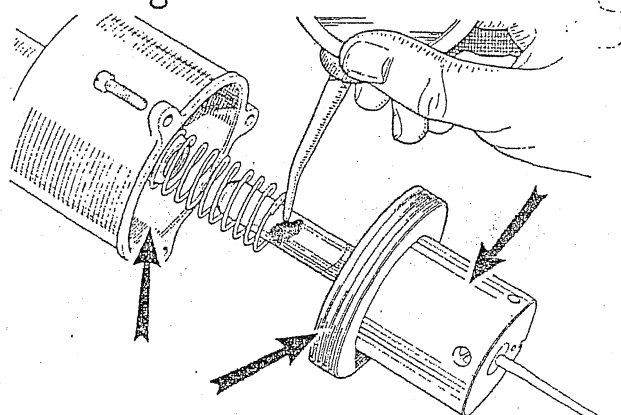


A.6391

17

- Remove the piston damper and apply pressure to the top of the piston rod with a pencil.
- Tighten the jet locking nut keeping the jet hard up against the jet bearing.
- Finally check again as in item 15.
- Re-fit the jet locking spring and adjusting nut. Before replacing the fuel feed pipe into the float-chamber, fit the rubber sealing washer over the end of the plastic pipe so that at least $\frac{3}{8}$ in. (4.8 mm.) of pipe protrudes (see inset). Reassemble the controls.
- Refill the piston dampers with the recommended engine oil (see item 8).

Cleaning

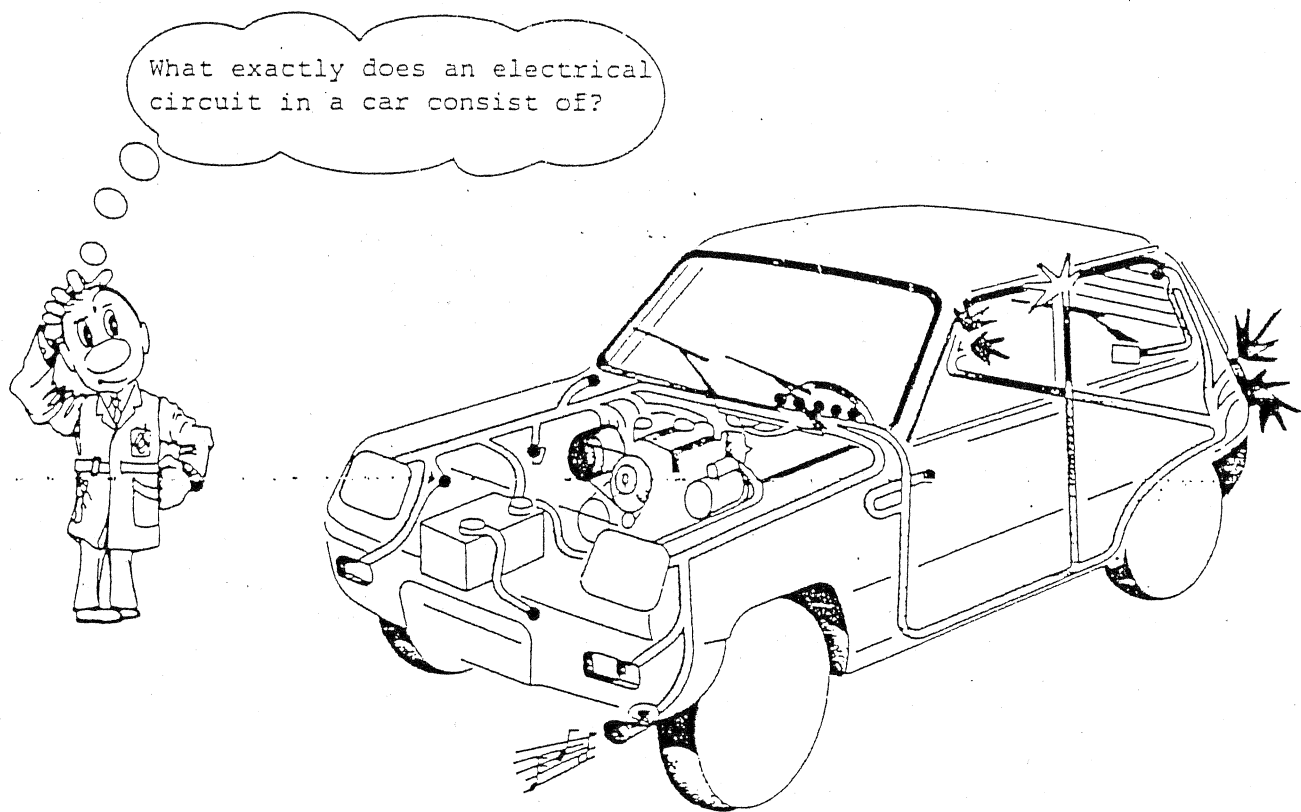


A.6205

18

- At the recommended intervals mark for reassembly and carefully remove the piston/suction chamber unit.
- Using a petrol-moistened cloth, clean the inside bore of the suction chamber and the two diameters of the piston.
- Lightly oil the piston rod only and reassemble as marked.
- Refill piston damper (see item 8).

VEHICLE ELECTRICAL CIRCUITS



GENERALLY SPEAKING IT CONSISTS OF:

A GENERATOR OF
CURRENT



DYNAMO or ALTERNATOR

A STORAGE OF
CURRENT



BATTERY

AND CONSUMERS OF
CURRENT



WIPER MOTOR, HORN
IGNITION SYSTEM etc

Connections between the various units are made using the WIRING HARNESS
(wires, connectors, fuses, switches, relays, etc).

AN ELECTRICAL CIRCUIT



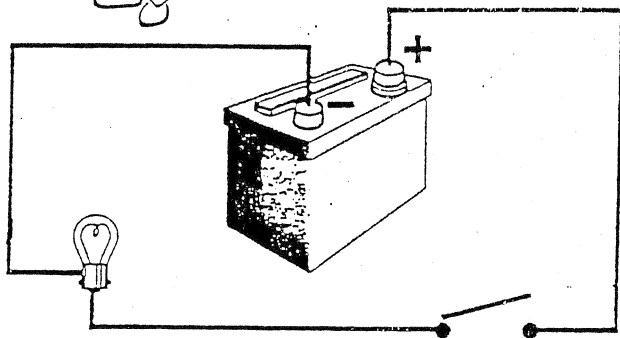
What does a
simple circuit
consist of?

A storage of current - BATTERY

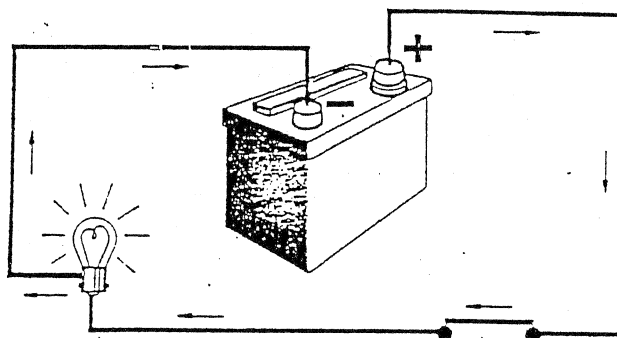
A conductor wire allowing the
current to pass

A consumer - BULB

A switch to close or open the
circuit to the bulb

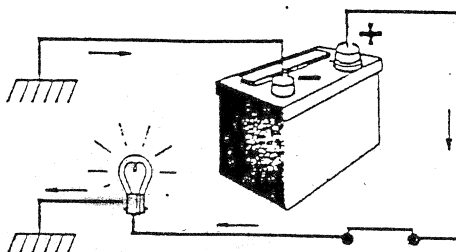
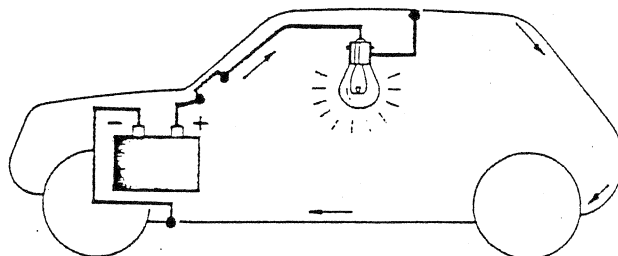
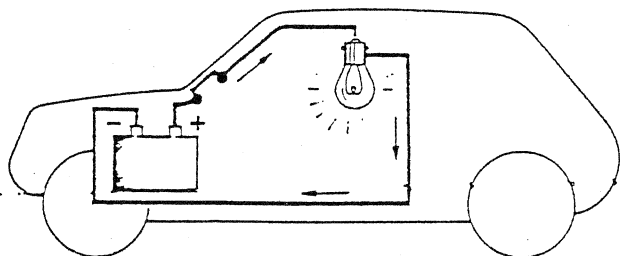


OPEN CIRCUIT
NO CURRENT FLOW



CLOSED CIRCUIT
CURRENT FLOWS

Outside the generator the current travels from + to - throughout the entire circuit.



In a car the + wire brings current to the bulb. The - wire returns current to the battery.

The bodyshell is made of steel and is therefore a conductor so it is used to return the current from the interior light to the battery by connecting the battery - to the bodyshell.

THIS IS AN EARTH RETURN SYSTEM

A poor earth has the same adverse effect as a poor feed.

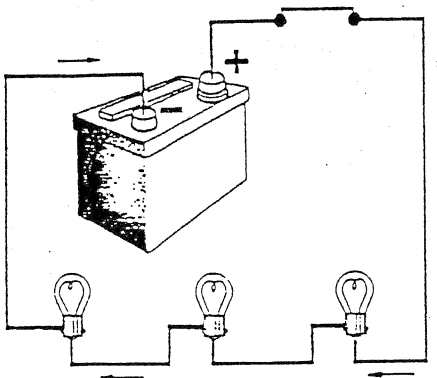
TYPES OF CIRCUIT



2 ways of making connections

①

All the consumers are wired 'end to end'. These are wired in SERIES.



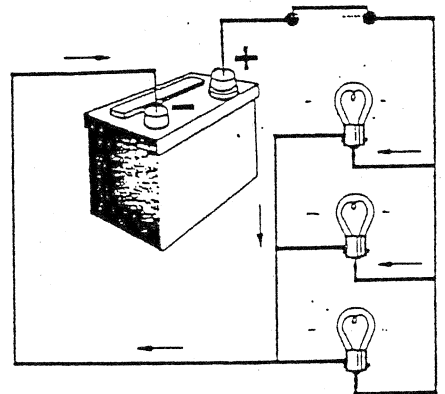
However, if the bulb filament is broken



ALL the circuit is broken.

②

The wire is split up in as many places as there are consumers. This is a PARALLEL system

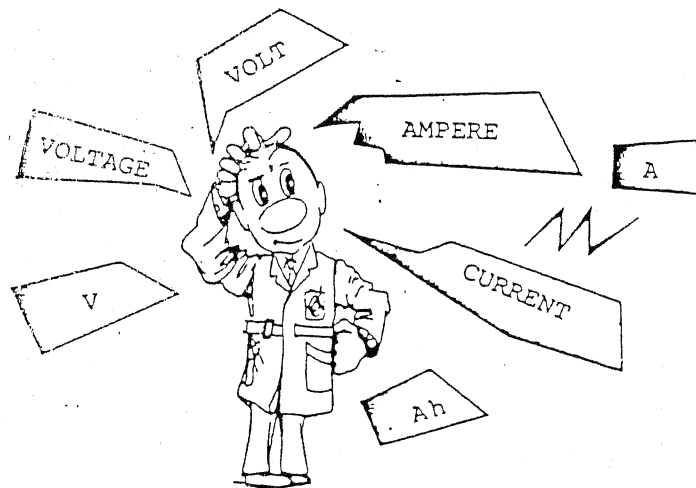


The operation of the other lamps is not affected.

CONSUMERS ARE FITTED IN PARALLEL IN A CAR

VOLTAGE AND CURRENT

The direction of the current is such that it leaves the battery + passes round the circuit and returns to the battery - .



How do you avoid getting confused ?

They are NOT the same.

VOLTAGE

V

Volt

SYMBOL

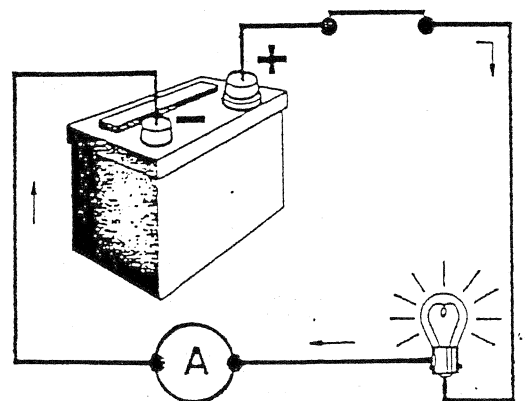
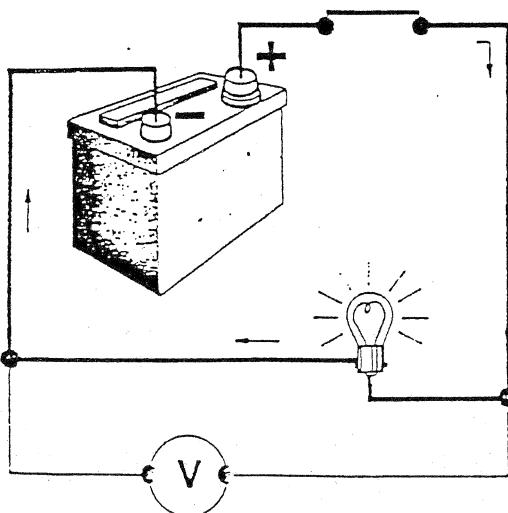
UNIT OF MEASUREMENT

CURRENT

A

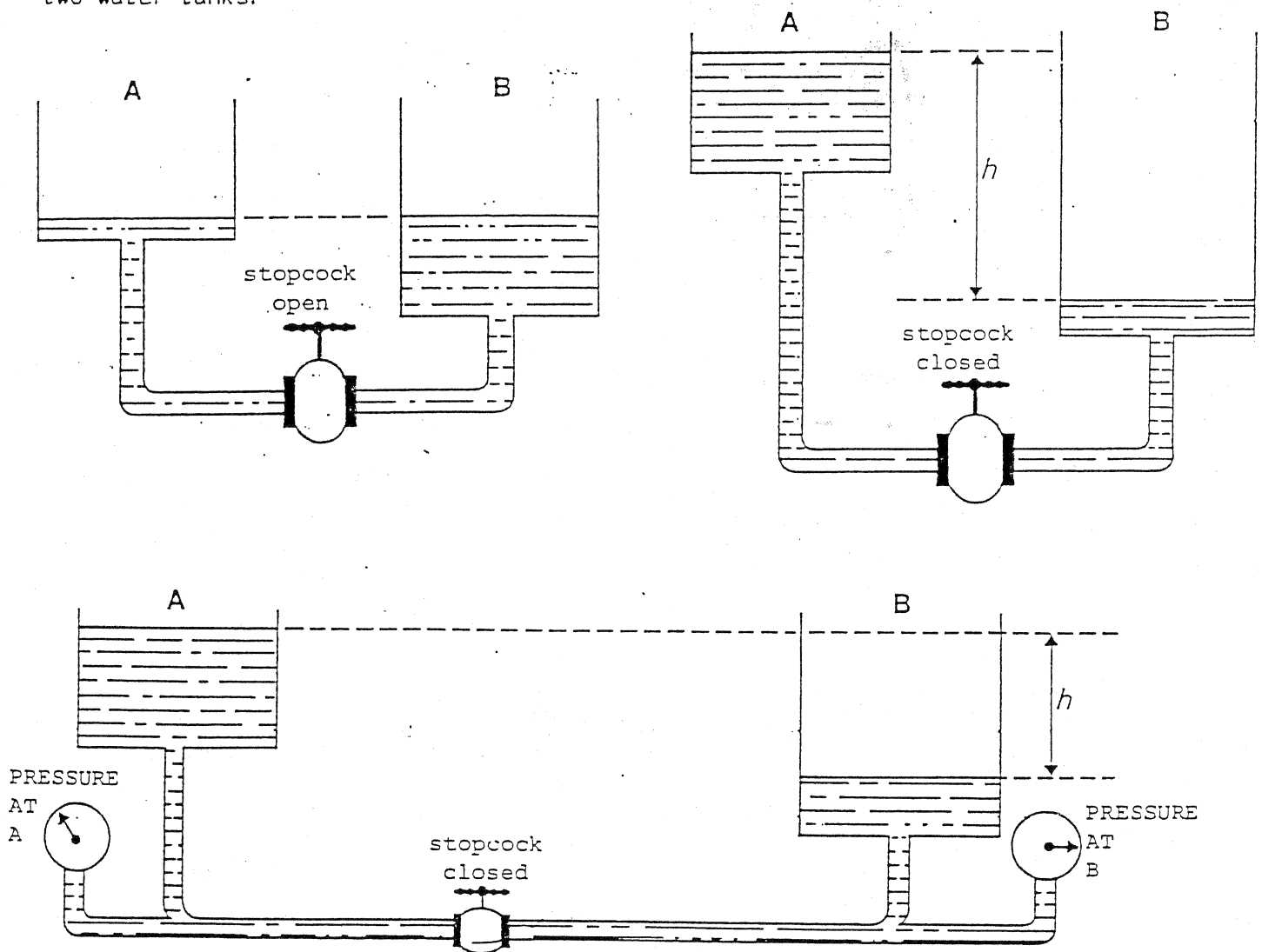
Ampere

MEASURING INSTRUMENT SYMBOL
AND CONNECTION



THE MEANING OF VOLTAGE

If two tanks 'A' and 'B' are connected by a pipe with a stopcock, when the stopcock is open and no water is being drawn off, the level is equal in both tanks. If you want water to circulate in the pipe when the stopcock is open, there must be a difference in height beforehand of the levels in the two water tanks.

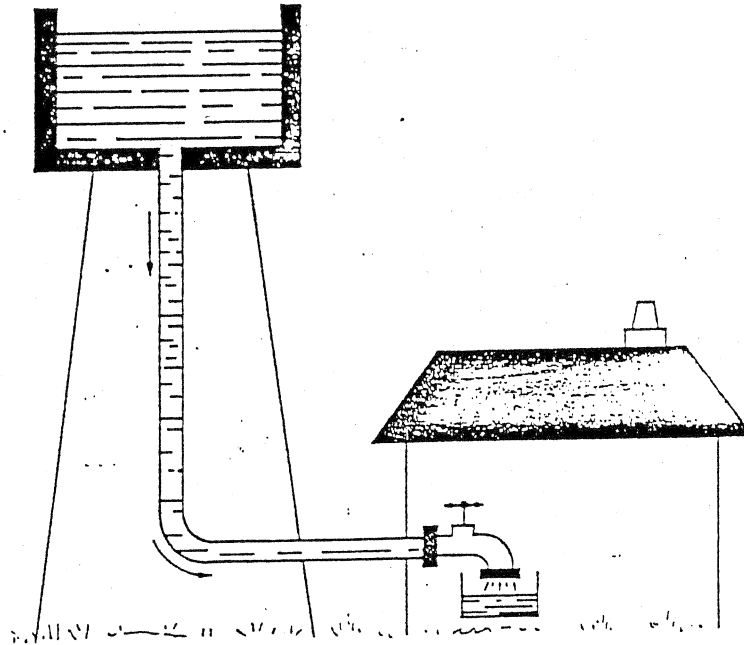


When the stopcock is closed, the difference in the height of the water in the two tanks determines a different pressure of water. As soon as the stopcock is opened, it is this difference in pressure which will cause water to flow from tank 'A' to tank 'B'. Flow will cease when there is no longer any pressure difference; the levels in both tanks will be the same.

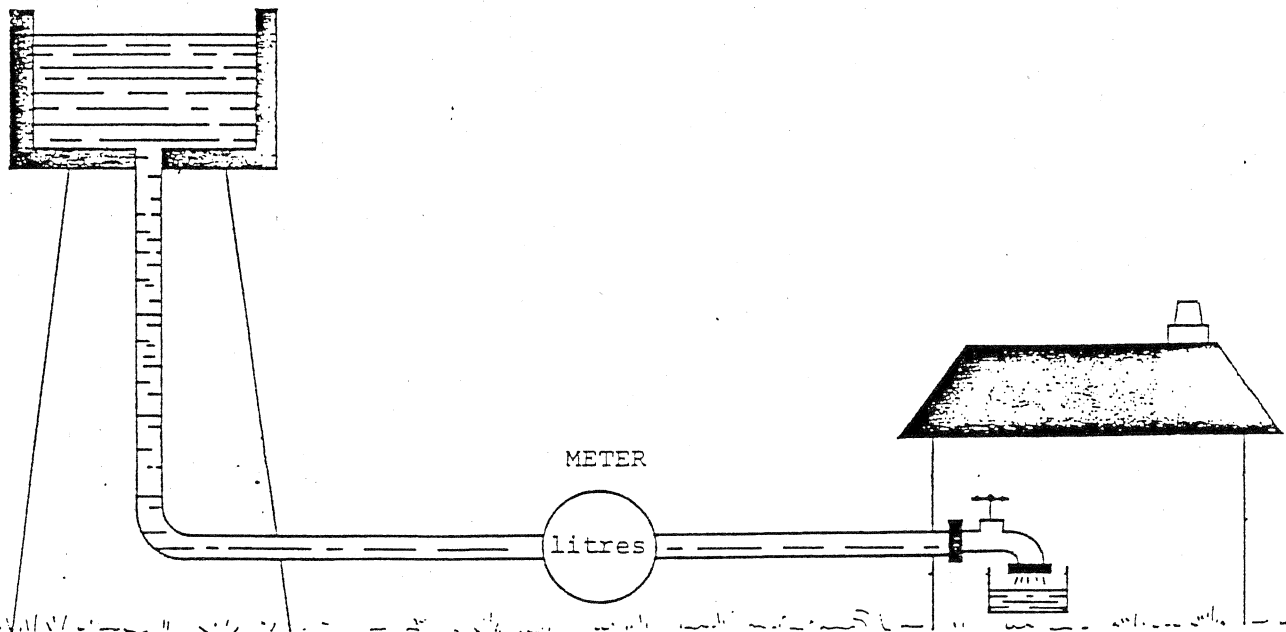
ELECTRICITY IS THE SAME - FOR A CURRENT TO FLOW IN A CIRCUIT IT IS NECESSARY TO HAVE A DIFFERENCE IN ELECTRICAL PRESSURE AT EACH END CALLED THE POTENTIAL DIFFERENCE. THIS IS THE VOLTAGE WHICH IS ALSO FOUND AT EACH CONNECTION.

THE MEANING OF CURRENT

Using the example applied to a water tower. In a hydraulic circuit, by analogy, current is the flow of water passing through the pipe.



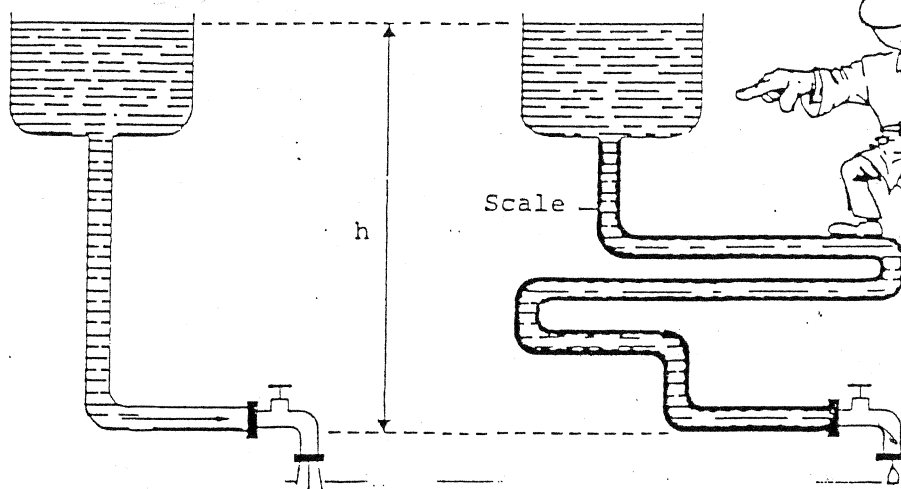
AMPERAGE IS THE QUANTITY OF CURRENT FLOWING IN A CIRCUIT.



A meter is incorporated in the circuit to measure water flow.

In the same way current or electricity flow is measured by placing an AMMETER in series with the circuit.

RESISTANCE



FLOW IS HIGH

The pipe section is wide and its length short. The bore is smooth and there are few bends.

FOR THE SAME PRESSURE

FLOW IS LOW

The pipe section is narrow and long. The bore is rough and there are many bends.

IN ELECTRICITY THIS IS CALLED RESISTANCE WHICH CONTROLS THE FLOW OF CURRENT

Bodies which pass current through - CONDUCTORS

Bodies which hinder current - INSULATORS

RESISTANCE

SYMBOL

—

R



UNIT OF MEASUREMENT

—

OHM Ω (Greek letter of the alphabet 'Omega')

MEASURING SYMBOL
AND CONNECTION OF
INSTRUMENT

—

OHMMETER



OHM-METER



connected to the terminals on the unit which is insulated

