

PHOTOGRAPHS OF CHARTS ON AUTO - ENGINEERING

AUTO-ENGINEERING (AE - 1) TWO STROKE OPERATION

ALL PORTS CLOSED
Upward moving piston compresses petrol vapour in cylinder.

POWER STROKE JUST STARTED
Fuel mix enters from above through reed valve. Piston rises forcing fuel through inlet ports into cylinder.

INLET PORT OPEN
New gas entering through reed valve. Piston rises forcing gas into cylinder.

TRANSFER AND EXHAUST PORTS OPEN
New gas being transferred up through transfer passage.

AUTO-ENGINEERING (AE - 2) FOUR STROKE OPERATION

MOST PETROL ENGINES WORK ON A FOUR STROKE CYCLE
In a four-cylinder engine, what cylinder one is on the first stroke, cylinder two is on the third stroke, cylinder three is on the fourth stroke and cylinder four is on the second stroke.
There is always one exploding cylinder, to turn the crankshaft.

AUTO-ENGINEERING (AE - 3) SINGLE CYLINDER ENGINE

BASIC COMPONENTS OF A FOUR STROKE PETROL ENGINE

WORKING OF A PETROL ENGINE WITH VALVE OPERATION

AUTO-ENGINEERING (AE - 4) FOUR STROKE PETROL ENGINE

SINGLE CYLINDER FOUR STROKE PETROL ENGINE

- 1 - Spark Plug
- 2 - Rocker
- 3 - Inlet
- 4 - Push Rod
- 5 - Cam
- 6 - Crankshaft
- 7 - Connecting Rod
- 8 - Camshaft
- 9 - Piston
- 10 - Cylinder
- 11 - Gas Pressure
- 12 - Exhaust
- 13 - Valve

AUTO-ENGINEERING (AE - 5) FOUR STROKE DIESEL ENGINE

Labels include: Atomizer, Push rod, Exhaust valve, Follower, Cam, Piston pin, Water jacket, Piston, Connecting rod, Crank, Lubricating oil frame, Rocker arm, Spring, Cylinder head, Inlet valve, Piston ring, Cam, Cylinder block, Connecting rod, Bucket tappet, Injection nozzle, Piston, Fuel injection pump, Toothed timing belt, Camshaft.

AUTO-ENGINEERING (AE - 6) COIL SYSTEM OF IGNITION

THE COIL IGNITION SYSTEM

THE DISTRIBUTOR, ROTOR ARM AND CAP

AUTO-ENGINEERING (AE - 7) ELECTRONIC IGNITION SYSTEM

AN ELECTRONIC IGNITION SYSTEM

IGNITION DISTRIBUTOR

AUTO-ENGINEERING (AE - 8) SPARK PLUGS

A spark plug is a device for delivering electric current from an ignition system to the tip of a spark-ignition engine to ignite the compressed fuel-air mixture by an electric spark, while containing combustion pressure within the engine.

SPARK PLUG HEAT RANGE AND REACH

- Spark plugs are designed so that they provide heat that is neither excessive in the heat-retaining tip nor insufficient in the heat-conducting insulator.
- The plug heat loss coefficient is generally poor performance.
- The plug heat loss coefficient is the heat-conducting ability of the plug and its insulator.
- Spark reach is the maximum forward portion of the spark plug tip that is the distance from the tip to the point where the spark plug tip is not properly.

CORRECT REACH vs **INCORRECT REACH**

AUTO-ENGINEERING (AE - 9) LAYOUT OF SIMPLE FUEL INJECTION SYSTEM

INJECTOR
To supply atomized fuel

INJECTION PUMP
To supply to injector at correct time fuel at high pressure

AUTO-ENGINEERING (AE - 10) IN-LINE PLUNGER TYPE FUEL INJECTION PUMP

CONSTRUCTION OF AN IN-LINE PLUNGER - TYPE FUEL - INJECTION PUMP

MOVEMENT OF THE TOOTHED CONTROL ROD TURNS THE PUMP PLUNGERS TO VARY THE AMOUNT OF FUEL INJECTED

NO FUEL DELIVERY | PARTIAL FUEL DELIVERY | MAXIMUM FUEL DELIVERY

AUTO-ENGINEERING (AE - 11) ROTARY DISTRIBUTOR TYPE FUEL INJECTION PUMP

ROTARY - DISTRIBUTOR INJECTION - PUMP SYSTEM

PRINCIPLE OF OPERATION

CHARGING

INJECTION

AUTO-ENGINEERING (AE - 12) MECHANICAL PETROL PUMP / ELECTRICAL PETROL PUMP

MECHANICAL PETROL PUMP

ELECTRICAL PETROL PUMP

AUTO-ENGINEERING (AE - 13) PISTON AND PISTON RINGS

PISTON AND PISTON RINGS

PISTON - AND - CONNECTING - ROD ASSEMBLY ATTACHED TO A CRANKPIN ON A CRANKSHAFT

AUTO-ENGINEERING (AE - 14) TYPES OF FUEL FILTERS

FUEL OIL FILTER

Types of fuel filters:

- In-line canister-type fuel filter
- Carburetor-mounted canister-type fuel filter
- Vapor-canister-type fuel filter

AUTO-ENGINEERING (AE - 15) FULL PRESSURE ENGINE LUBRICATING SYSTEM

FULL - PRESSURE ENGINE LUBRICATING SYSTEM

TYPES OF LUBRICATING SYSTEMS

- SPLASH
- COMBINATION SPLASH AND FORCE FEED
- FORCE FEED
- FULL FORCE FEED

AUTO-ENGINEERING (AE - 16) CIRCULATING SPLASH LUBRICATING SYSTEM

CIRCULATING SPLASH LUBRICATING SYSTEM

CONNECTING-ROD BEARING LUBRICATION

GEAR TYPE OIL PUMP | **SLIDING VANE TYPE OIL PUMP**

AUTO-ENGINEERING (AE - 17) ENGINE COOLING SYSTEM

WATER PUMP AND THERMOSTAT

DOWN-FLOW TYPE OF TUBE-AND-FIN RADIATOR

OPERATION OF THERMOSTAT VALVE

AUTO-ENGINEERING (AE - 18) STARTER MOTOR

A GEAR - REDUCTION, OVERRUNNING - CLUTCH STARTING MOTOR

INTERNAL OPERATING MECHANISM OF THE STARTING MOTOR USING A SLIDING POLE SHOE

AUTO-ENGINEERING (AE - 19) CONSTANT MESH GEAR BOX

CONSTANT MESH GEAR BOX

THIRD | **FOURTH**

AUTO-ENGINEERING (AE - 20) FOUR SPEED SLIDING MESH GEAR BOX

FOUR SPEED SLIDING MESH GEAR BOX

THIRD | **FOURTH**

AUTO-ENGINEERING (AE - 21) SYNCHROMESH GEAR BOX

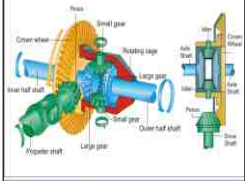
SYNCHROMESH ENGAGEMENT OF GEARS

(A) SELECTOR IN NEUTRAL | (B) SELECTOR MOVED TO ENGAGE CONE FACES TO SYNCHROMESH SPEED | (C) GEAR SELECTED

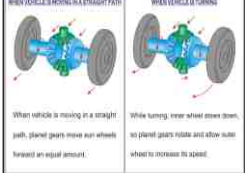
AUTO-ENGINEERING (AE - 22)

ACTION OF DIFFERENTIAL

THE DIFFERENTIAL UNIT

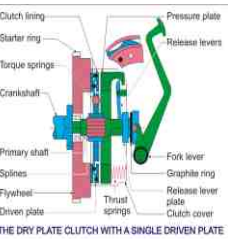


WORKING OF THE DIFFERENTIAL UNIT



AUTO-ENGINEERING (AE - 23)

SINGLE PLATE CLUTCH



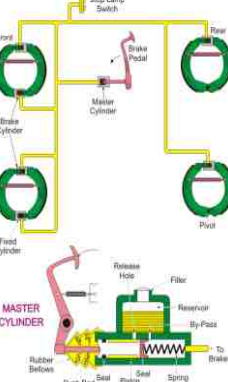
THE DRY PLATE CLUTCH WITH A SINGLE DRIVEN PLATE



AUTO-ENGINEERING (AE - 24)

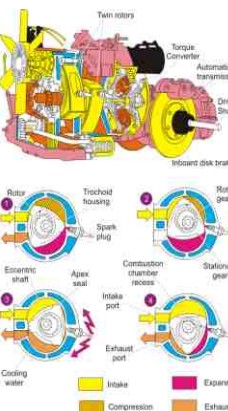
HYDRAULIC BRAKE SYSTEM

THE HYDRAULIC BRAKE SYSTEM



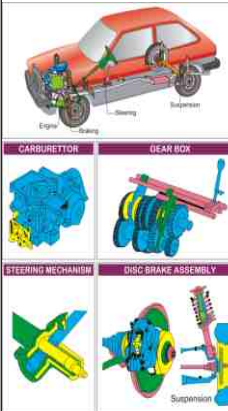
AUTO-ENGINEERING (AE - 25)

WANKEL ENGINE



AUTO-ENGINEERING (AE - 27)

THE CAR



AUTO-ENGINEERING (AE - 28)

LUBRICATING OILS

THE PURPOSE OF LUBRICATION

The purpose of a thin film of lubricating oil between the moving and fixed parts of the engine is the only reason for it continuing to work satisfactorily. Without this film the engine would wear in a very short time and be useless. Therefore the lubricating system in the motor vehicle parts of an automobile engine.

LUBRICATING OILS

There are two types of oils that may be used for lubrication:

- 1) **Mineral Oil** - Obtained by distillation of crude petroleum and used for all normal motoring.
- 2) **Vegetable Oil** - This type of oil is only used for racing and competitive work, as although it is superior under extreme conditions it is expensive, must be kept pure by gumming up parts of the engine such as piston rings.

MAIN COMPONENTS OF A LUBRICATING SYSTEM

TYPICAL OIL FILTER CIRCUIT

OIL PUMP PICKUP

LUBRICATION OF CONNECTING ROD BEARINGS

LUBRICATION AT THE WOCKER ARM