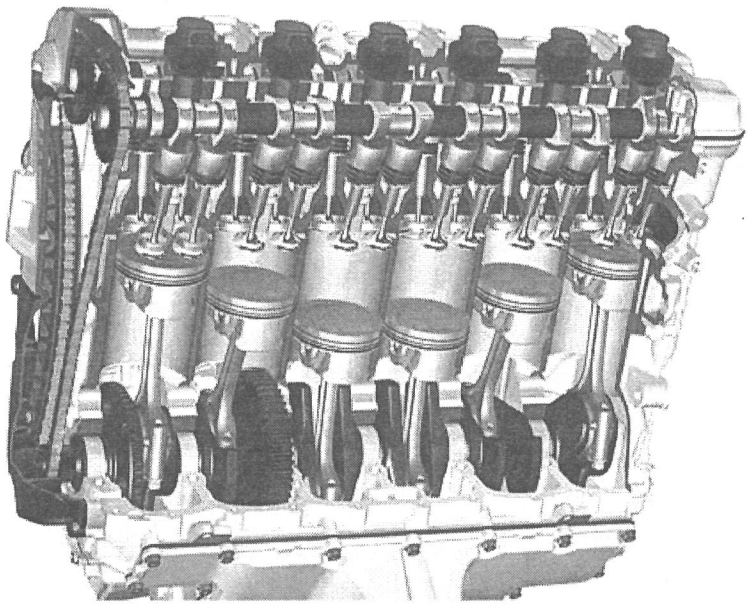
کارشناسی - زبان تخصصی

Technical Language Notes-۲

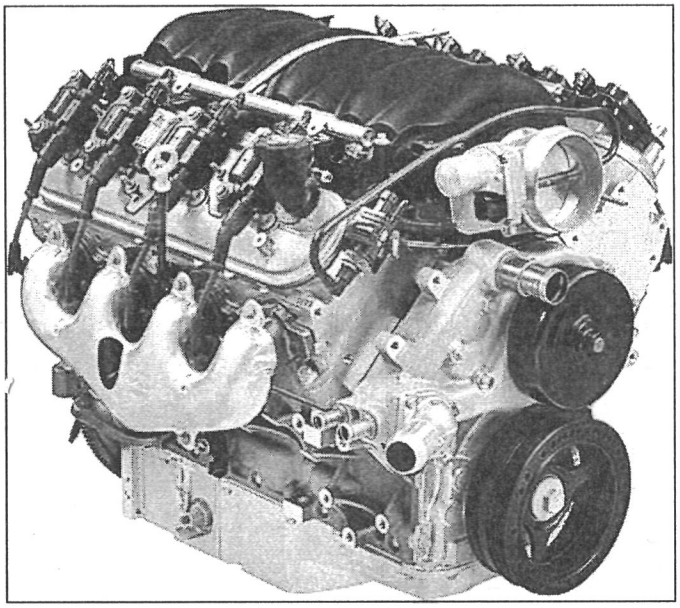
For Automotive Mechanical Engineering Students



Dr. Farzin Azimpour shishevan

What are the main parts of a car engine?

Car engines are built around a set of "cooking pots" called cylinders (usually anything from two to twelve of them, but typically four, six, or eight) inside which the fuel burns. The cylinders are made of super-strong metal and sealed shut, but at one end they open and close like bicycle pumps: they have tight-fitting pistons (plungers) that can slide up and down inside them. At the top of each cylinder, there are two valves (essentially "gates" letting things in or out that can be opened and closed very quickly). The inlet valve allows fuel and air to enter the cylinder from a carburetor or electronic fuel-injector; the outlet valve lets the exhaust gases escape. At the top of the cylinder, there is also a sparking plug (or spark plug), an electrically controlled device that makes a spark to set fire to the fuel. At the bottom of the cylinder, the piston is attached to a constantly turning axle called a crankshaft. The crankshaft powers the car's gearbox which, in turn, drives the wheels.



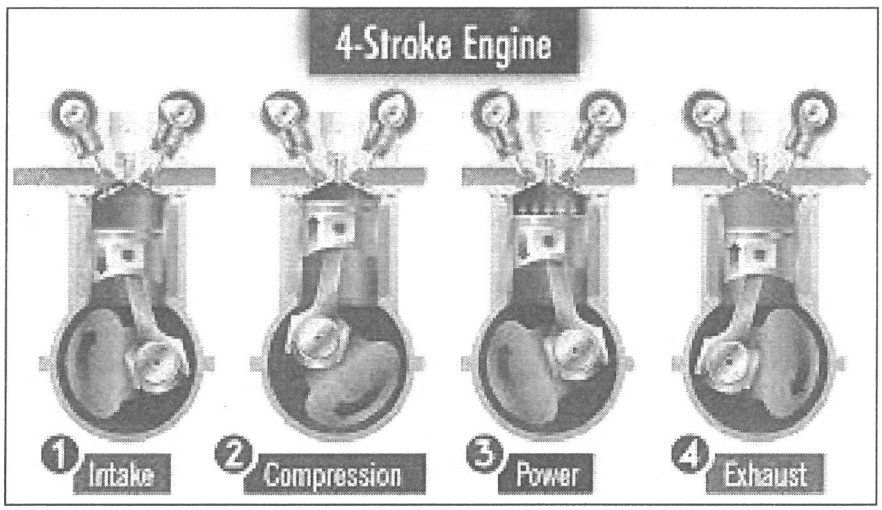
Watch this photo and you'll see that a car engine makes its power by endlessly repeating a series of four steps (called strokes):

Intake: The piston (green) is pulled down inside the cylinder (gray) by the momentum of the crankshaft (gray wheel at the bottom). Most of the time the car is moving along, so the crankshaft is always turning. The inlet valve (left) opens, letting a mixture of fuel and air (blue cloud) into the cylinder through the purple pipe.

Compression: The inlet valve closes. The piston moves back up the cylinder and compresses (squeezes) the fuel-air mixture, which makes it much more flammable. When the piston reaches the top of the cylinder, the sparking plug (yellow) fires.

Power: The spark ignites the fuel-air mixture causing a mini explosion. The fuel burns immediately, giving off hot gas that pushes the piston back down. The energy released by the fuel is now powering the crankshaft.

Exhaust: The outlet valve (right) opens. As the crankshaft continues to turn, the piston is forced back up the cylinder for a second time. It forces the exhaust gases (produced when the fuel burned) out through the exhaust outlet (blue pipe).



How many cylinders does an engine need?

One problem with the four-stroke design is that the crankshaft is being powered by the cylinder for only one stage out of four. That's why cars typically have at least four cylinders, arranged so they fire out of step with one another. At any moment, one cylinder is always going through each one of the four stages—so there is always

one cylinder powering the crankshaft and there's no loss of power. With a ١٢-cylinder engine, there are at least three cylinders powering the crankshaft at any time—and that's why those engines are used in fast and powerful cars.

How big do the cylinders need to be?

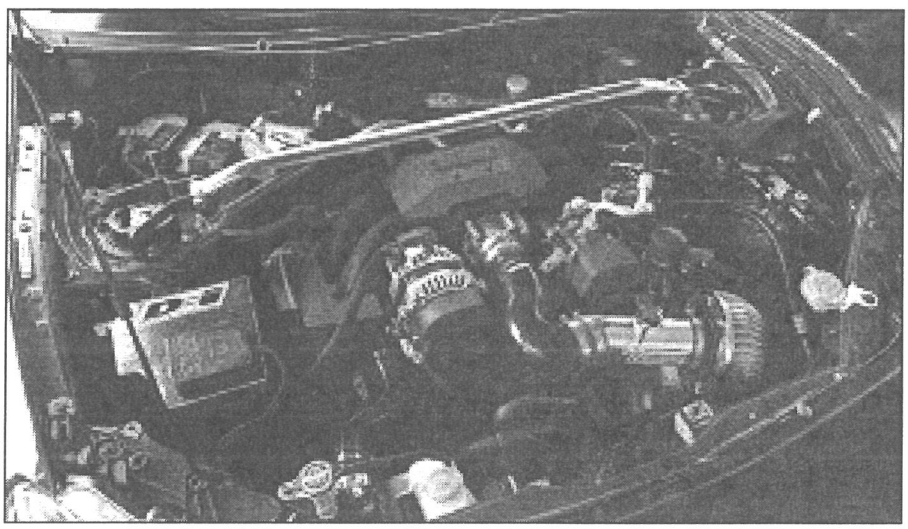
It's not just how many cylinders a car has that's important but how much power each one can make as it pushes out its piston. That depends on the size of the cylinder, which, in turn, depends on two key measurements: the diameter of the cylinder (called its bore) and how far the piston moves out (its stroke). The area of a circle is $\pi \times \text{radius}^2$, and since the bore is twice the radius, the useful volume of a car cylinder is $(\pi/4) \times \text{bore} \times \text{bore} \times \text{stroke}$. In physics terms, the volume of the cylinder is related to how much work the fuel does as it expands, how much energy it transfers to the piston, and (if we consider how often this happens), how much power the car makes. So the bore and stroke are very important—and that's why they're often quoted in technical specifications for car engines along with the number of cylinders. You'll often see these measurements written in the form bore × stroke (so, for example, ٩٠ × ٨٦mm means a bore of ٩٠mm and a stroke of ٨٦mm).

You'll also see the total volume of a car's cylinders quoted in a measurement called the displacement, which is the volume of a car's cylinders multiplied by how many

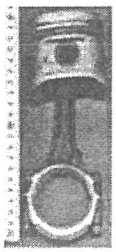
of them there are. (In other words, it's $\pi/4$ × bore × bore × stroke × number of cylinders.) So when you hear a car described as having a "two-liter engine," that usually means it has four cylinders of ٠,٥ liters or six cylinders of ٠,٣٣ liters. The displacement is a rough guide to how much power a car engine can make and you'll usually see it quoted in either liters or cc (cubic centimeters); ١ liter is the same as ١٠٠٠ cc.

How can we make cleaner engines?

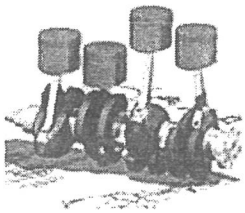
There's no doubt that Otto's gasoline engine was an invention of genius—but it's now a victim of its own success. With around a billion cars on the planet, the pollution produced by vehicles is a serious—and still growing—problem. The carbon dioxide released when fuels are burned is also a major cause of global warming. The solution could be electric cars that get their energy from cleaner sources of power or hybrid cars that use a combination of electricity and gasoline power.



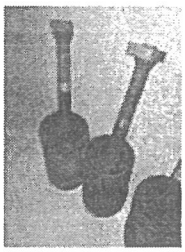
The hot gases expand, pushing the piston to the bottom of the cylinder. The piston is returned to the cylinder top (Top Dead Centre) either by a flywheel or the power from other pistons connected to the same shaft. In most types the expanded or "exhausted" gases are removed from the cylinder by this stroke. The exception is the Sterling engine, which repeatedly heats and cools the same sealed quantity of gas.



A piston and its connecting rod.



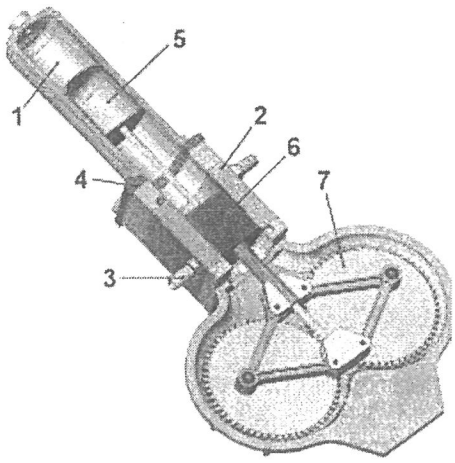
CAD drawing of crankshaft and pistons.



Large pistons (over 0.5 m incl. connecting rod).

Sterling piston engine:

Rhombic Drive – Beta Sterling Engine Design showing the second displacer piston (green) within the cylinder which shunts the working gas between the hot and cold ends, but produces no power itself.



1 – Hot cylinder wall

2 – Cold cylinder wall

5 – Displacer piston

6 – Power piston

7 – Flywheels

Reciprocating engine:

A reciprocating engine, also often known as a piston engine, is a heat engine that uses one or more reciprocating pistons to convert pressure into a rotating motion. This article describes the common features of all types. The main types are: the internal combustion engine, used extensively in motor vehicles; the steam engine, the mainstay of the Industrial Revolution; and the niche application Stirling engine.

Internal combustion piston engine:

Components of a typical, four stroke cycle, internal combustion piston engine.

E - Exhaust camshaft

I - Intake camshaft

S - Spark plug

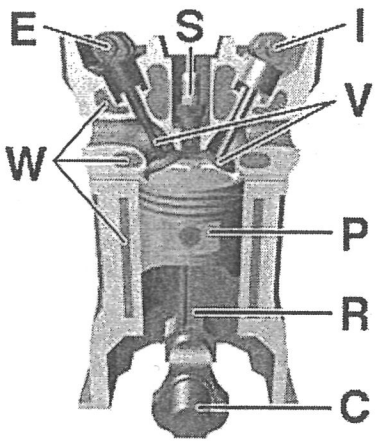
V - Valves

P - Piston

R - Connecting rod

C - Crankshaft

W - Water jacket for coolant flow



Common features in all types:

There may be one or more pistons. Each piston is inside a cylinder, into which a gas is introduced, either already hot and under pressure (steam engine), or heated inside the cylinder either by ignition of a fuel air mixture (internal combustion engine) or by contact with a hot heat exchanger in the cylinder (Stirling engine).

Crankshaft:

The crankshaft, sometimes casually abbreviated to crank, is the part of an engine which translates reciprocating linear piston motion into rotation. To convert the reciprocating motion into rotation, the crankshaft has "crank throws" or "crankpins", additional bearing surfaces whose axis is offset from that of the crank, to which the "big ends" of the connecting rods from each cylinder attach.

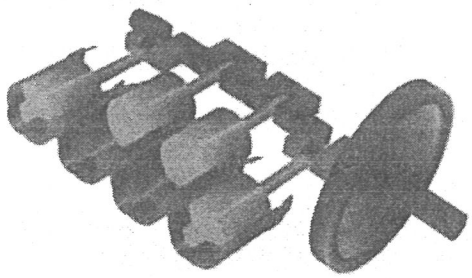
It typically connects to a flywheel, to reduce the pulsation characteristic of the four-stroke cycle, and sometimes a torsional or vibrational damper at the opposite end, to reduce the torsion vibrations often caused along the length of the crankshaft by the cylinders farthest from the output end acting on the torsional elasticity of the metal.

Crankshaft (red),

Pistons (gray)

In their cylinders (blue),

Flywheel (black)



Poppet valve:

A poppet valve (also called mushroom valve) is a valve consisting of a hole, usually round or oval, and a tapered plug, usually a disk shape on the end of a shaft also called a valve stem. The shaft guides the plug portion by sliding through a valve guide. In most applications a pressure differential helps to seal the valve and in some applications also open it.

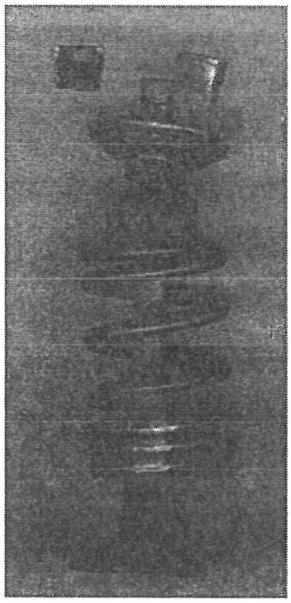
Presta and Schrader valves used on pneumatic tires are examples of poppet valves. The Presta valve has no spring and relies on a pressure differential for opening and closing while being inflated.

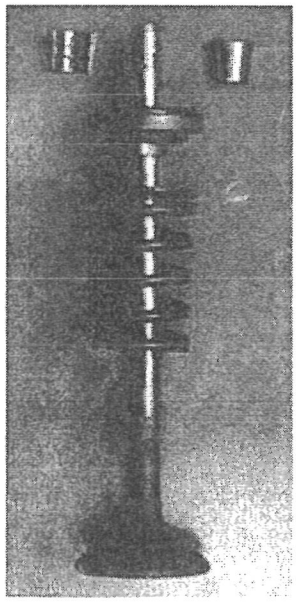
Operation:

The operating principle of poppet valves is described in "How Poppet Valves Work".In most cases it is beneficial to have a "balanced poppet" in a direct-acting valve. Less force is needed to move the poppet because all forces on the poppet are nullified by equal and opposite forces. The solenoid coil has to counteract only the spring force

Applications:

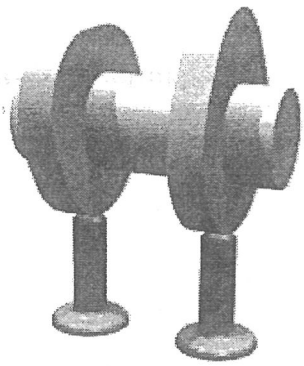
Poppet valves are used in many industrial processes, from controlling the flow of milk to isolating sterile air in the semiconductor industry. However, they are most well known for their use in internal combustion and steam engines, as described below.





Camshaft:

A camshaft is a shaft to which a cam is fastened or of which a cam forms.



Uses:

In internal combustion engines with pistons, the camshaft is used to operate poppet valves. It then consists of a cylindrical rod running the length of the cylinder bank with a number of oblong lobes protruding from it, one for each valve. The cams force the valves open by pressing on the valve, or on some intermediate mechanism as they rotate.

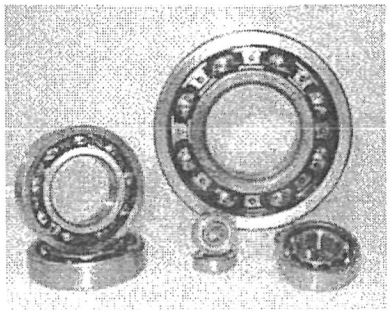
Material:

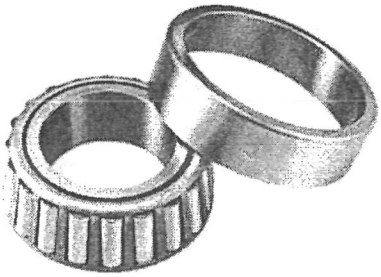
Camshafts can be made out of several different types of material. These include:

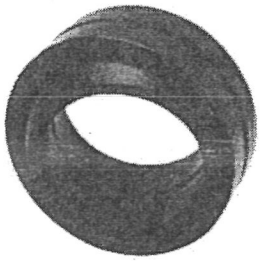
Chilled iron castings: this is a good choice for high volume production. A chilled iron camshaft has a resistance against wear because the camshaft lobes have been chilled, generally making them harder. When making chilled iron castings, other elements are added to the iron before casting to make the material more suitable for its application.

Billet Steel: When a high quality camshaft is required, engine builders and camshaft manufacturers choose to make the camshaft from steel billet. This method is also used for low volume production. This is a much more time consuming process, and is generally more expensive than other methods. However the finished product is far superior. When making the camshaft, CNC lathes, CNC milling machines and CNC camshaft grinders will be used.

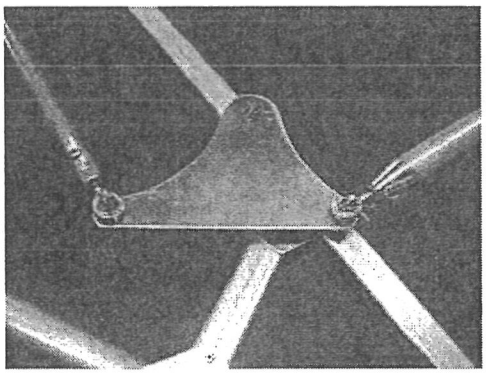
Bearing (ball, roller, and spherical shown) (n) The part of a machine within which a rotating or sliding shaft is held. In some bearing types, balls or rollers are used between the bearing surfaces to reduce rolling friction.



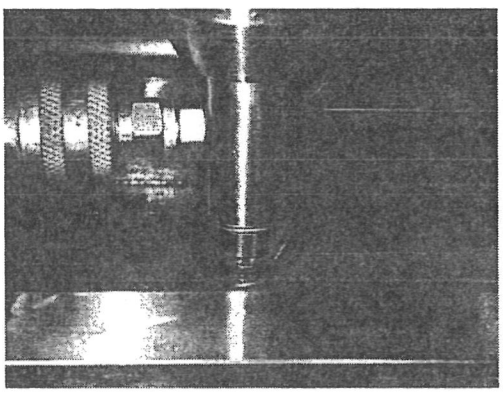




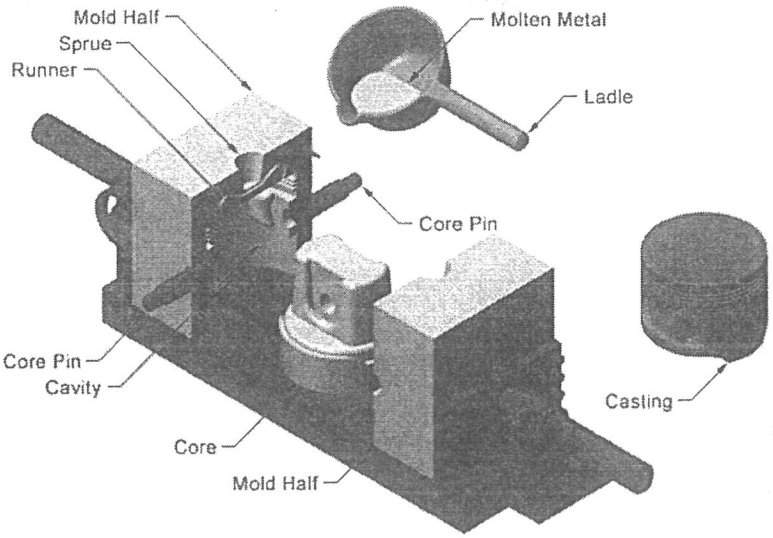
Bell crank (n) a pivoting double lever used to change the direction of applied motion.



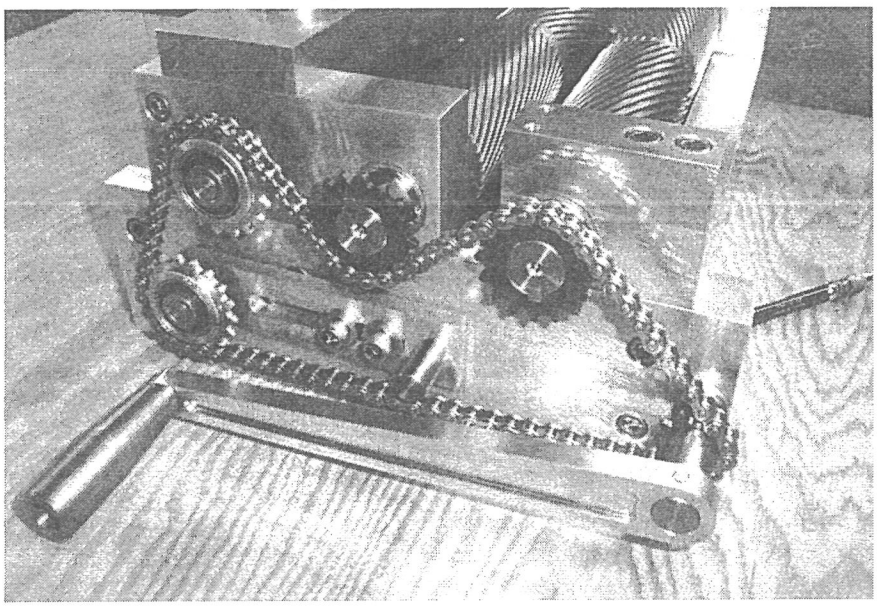
Burnish (v) To smooth or polish by a rolling or sliding tool under pressure.



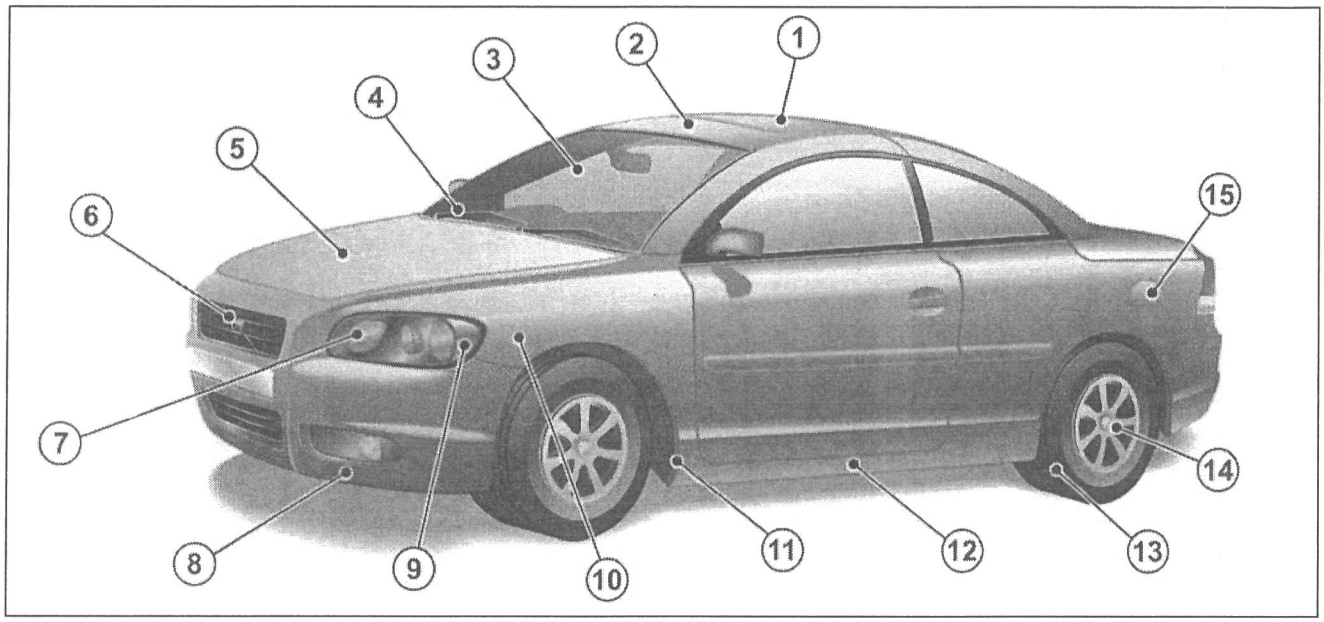
Casting (n) Any object made by pouring molten metal into a mold.

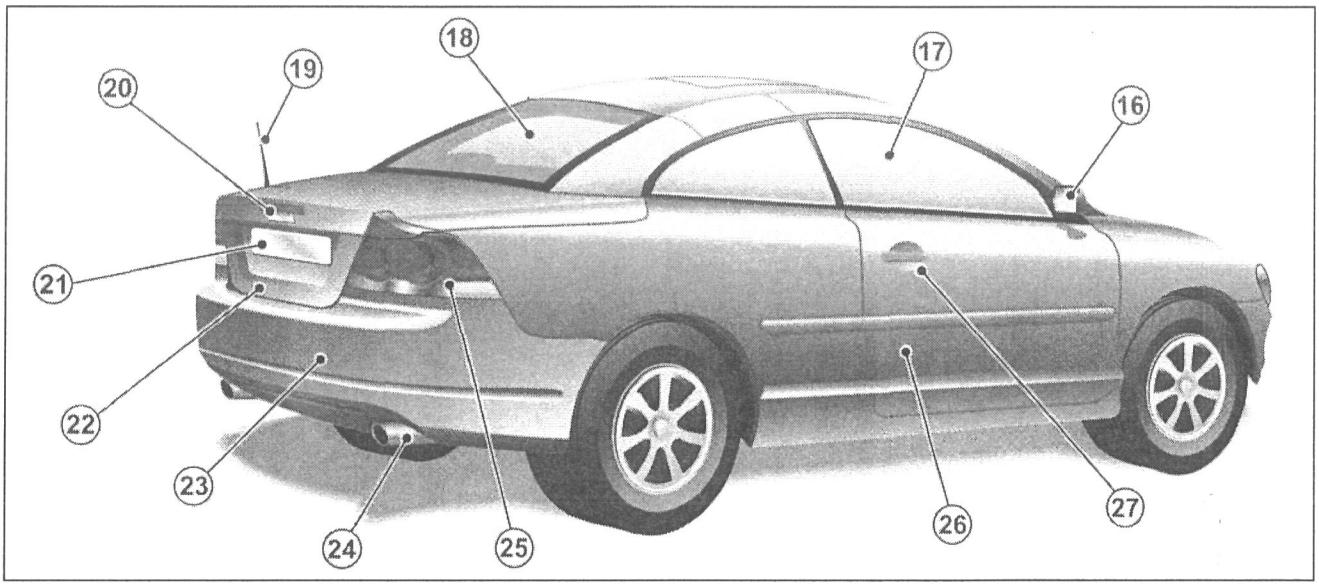


Idler (n) A mechanism used to regulate the tension in belt or chain. Or, a gear used between a driver and follower gear to maintain the direction of rotation.



Car Parts





١. سان روف
٢. سقف
٣. شیشه جلو
٤. برف پاک کن

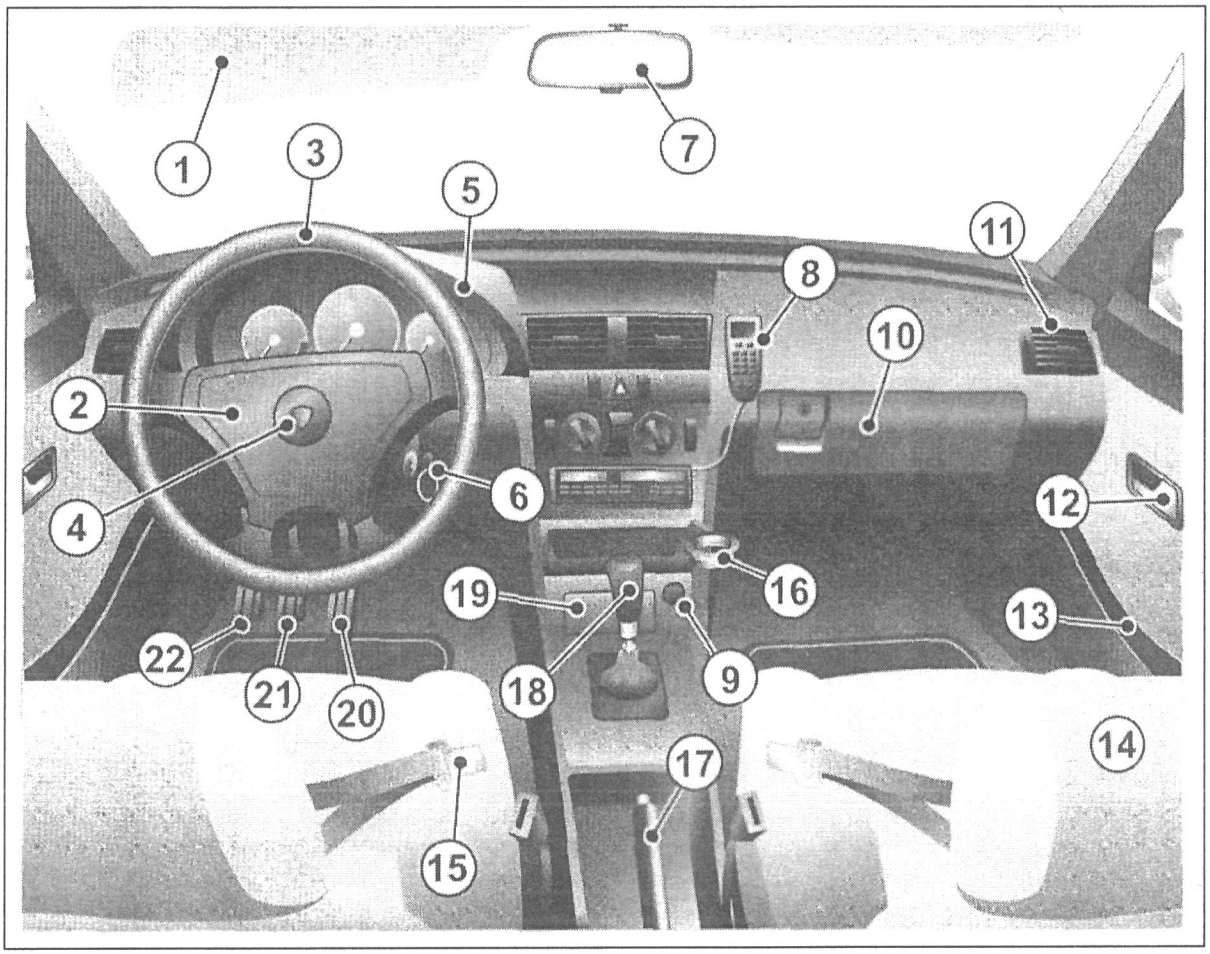
١. sunroof
٢. roof
٣. Windscreen (windshield)
٤. Windscreen wiper

Car Parts

٥. Bonnet (hood)
٦. Logo
٧. Headlight
٨. Front bumper
٩. Indicator (turn signal)
١٠. Wing (fender)
١١. Wheel arch
١٢. Sill
١٣. Tyre (tire)
١٤. Wheel trim
١٥. Petrol cap or flap (gas tank lid)
١٦. Wing mirror
١٧. Side window
١٨. Rear window
١٩. Aerial (antenna)
٢٠. Badge
٢١. Number plate (license plate)
٢٢. Boot (trunk)
٢٣. Rear bumper
٢٤. Exhaust pipe
٢٥. Rear light
٢٦. Door
٢٧. Door handle

٥. کاپوت
٦. لوگو
٧. چراغ جلو
٨. سپر جلو
٩. راهنما
١٠. گلگیر
١١. دور گلگیر
١٢. رکاب
١٣. چرخ
١٤. قالپاق
١٥. در باک
١٦. آینه بغل
١٧. شیشه کنار
١٨. شیشه عقب
١٩. آنتن
٢٠. آرم
٢١. پلاک
٢٢. صندوق عقب
٢٣. سپر عقب
٢٤. لوله اگزوز
٢٥. چراغ عقب
٢٦. در
٢٧. دستگیره در

Car Parts



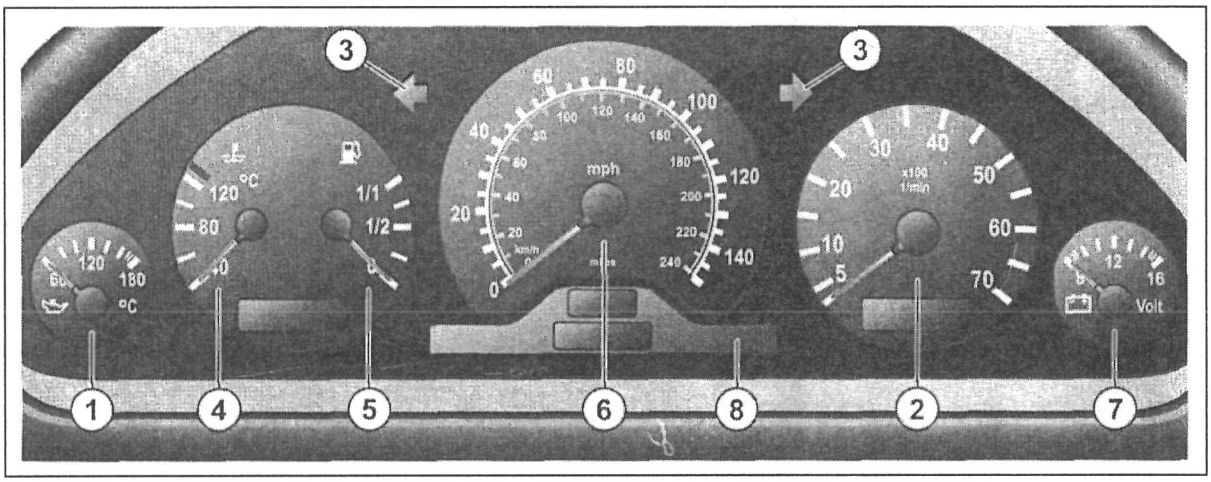
١. آفتاب گیر
٢. ایربگ
٣. فرمان
٤. بوق
٥. داشبورد
٦. استارت
٧. آینه دید عقب
٨. تلفن هندز فری
٩. فندک
١٠. داشبورد

١. sun visor
٢. Airbag
٣. Steering wheel
٤. Horn
٥. Dashboard
٦. Ignition
٧. Rear-view mirror
٨. Hands-free telephone
٩. Cigarette lighter
١٠. Glove compartment (glove box)

Car Parts

١١. Air vent
١٢. Door handle
١٣. Door tray
١٤. Car seat (headrest)
١٥. Seat belt
١٦. Cup holder
١٧. Handbrake
١٨. Gear stick (gear shift/stick shift)
١٩. Ashtray
٢٠. Accelerator (gas pedal)
٢١. Brake pedal
٢٢. Clutch pedal

١١. هواکش
١٢. دستگیره در
١٣. جا دری
١٤. صندلی
١٥. کمربند
١٦. جا لیوانی
١٧. ترمز دستی
١٨. دنده
١٩. جا سیگاری
٢٠. پدال گاز
٢١. پدال ترمز
٢٢. پدال کلاچ



١. engine oil temperature gauge
٢. Rev counter
٣. Hazard warning/indicator lights
٤. Coolant temperature gauge

١. نشانگر حرارت روغن
٢. دور موتور
٣. نشانگر راهنما
٤. نشانگر دما

Car Parts

٥. نشانگر بنزین

٦. سرعت سنج

٧. ولت متر

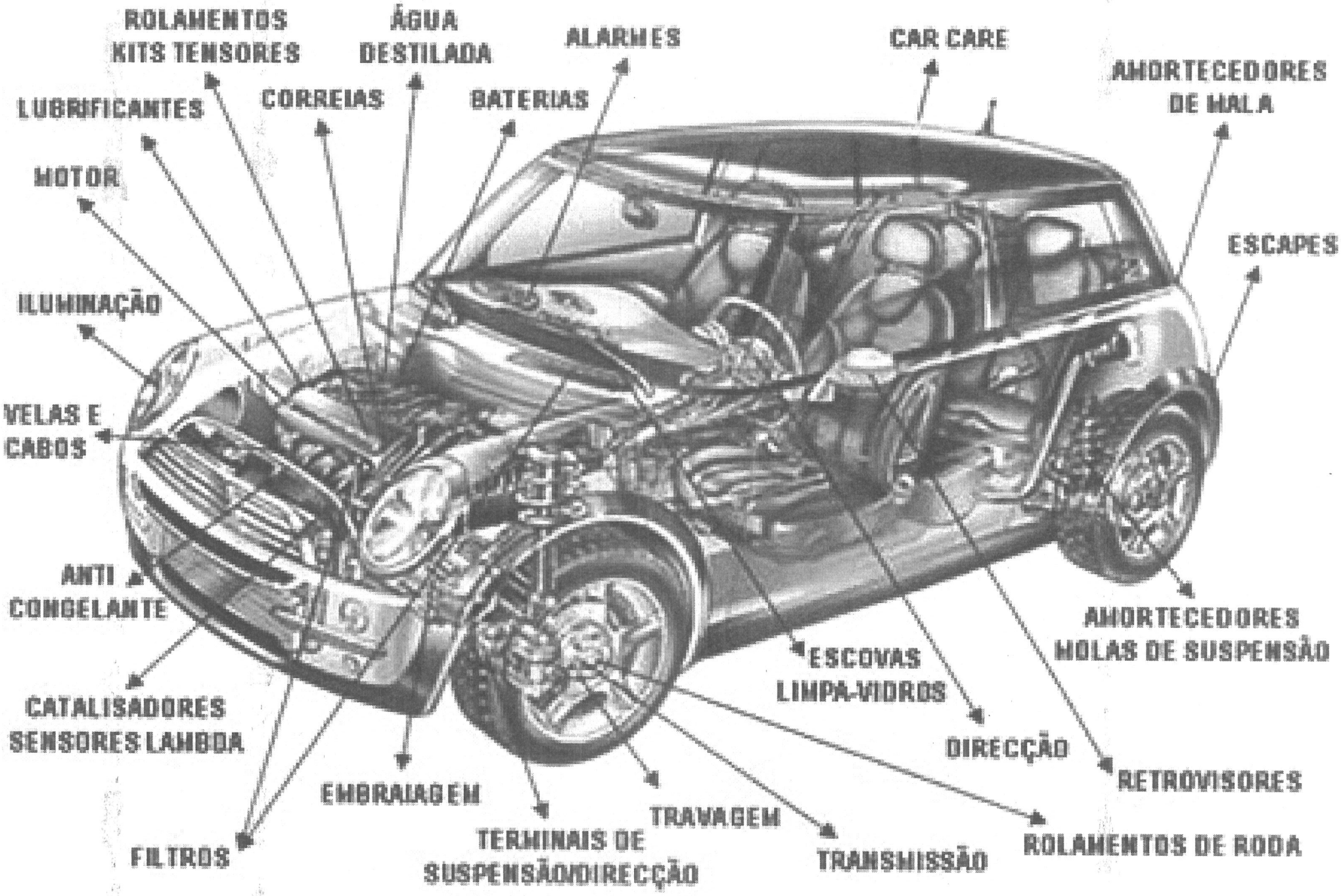
٨. سیستم اطلاعات راننده

٥. Fuel gauge

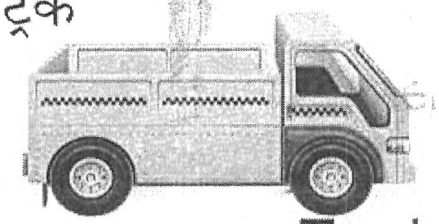
٦. Speedometer

٧. Voltmeter

٨. Driver information system

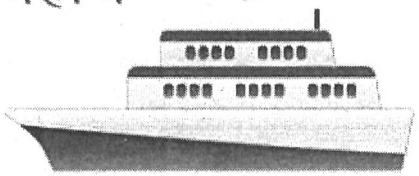

ROLAMENTOS
KITS TENSORES
ÁGUA
DESTILADA
ALARMES
CAR CARE
AMORTECEDORES
DE MALA
LUBRIFICANTES
CORREIAS
BATERIAS
MOTOR
ESCAPES
ILUMINAÇÃO
VELAS E
CABOS
ANTI
CONGELANTE
AMORTECEDORES
MOLAS DE SUSPENSÃO
ESCOVAS
LIMPA-VIDROS
CATALISADORES
SENSORES LAMBDA
DIRECÇÃO
RETROVISORES
EMBRAIAGEM
TRAVAGEM
TERMINAIS DE
SUSPENSÃO/DIRECÇÃO
TRANSMISSÃO
ROLAMENTOS DE RODA
FILTROS

ट्रक



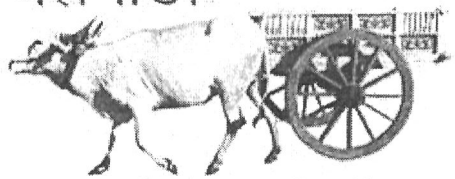
Truck

जहाज



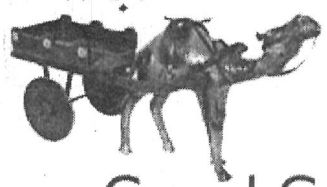
Ship

बैलगाडी



Bullock Cart

ऊँट गाड़ी

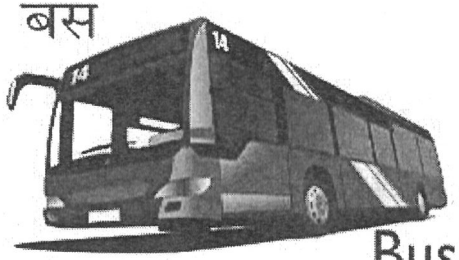


Camel Cart

हवाईजहाज

Airplane

बस

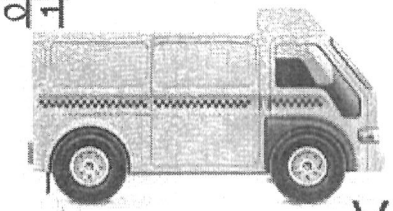


Bus

ऑटो रिक्शा

Auto Rickshaw

वैन

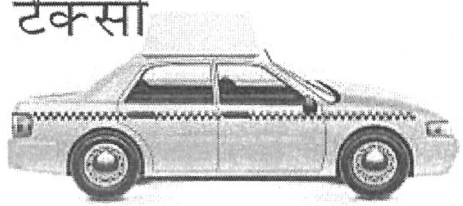


Van

बाईक

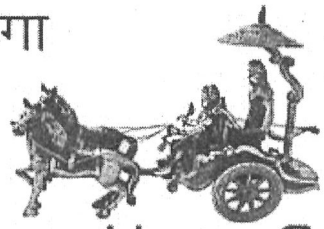
Bike

टैक्सी



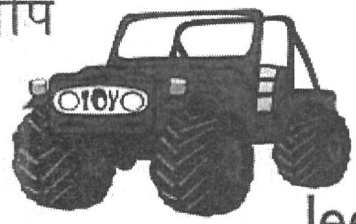
Taxi

तांगा



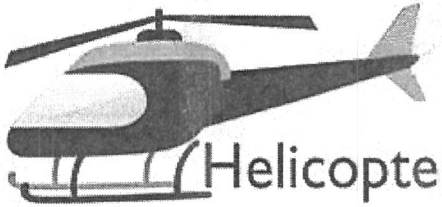
Horse Cart

जीप



Jeep

हैलीकॉटर

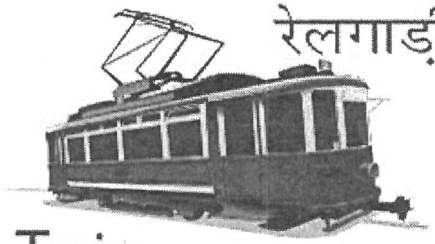


Helicopter

साईकिल

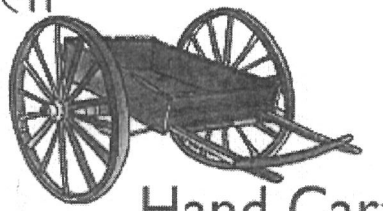
Bicycle

रेलगाड़ी

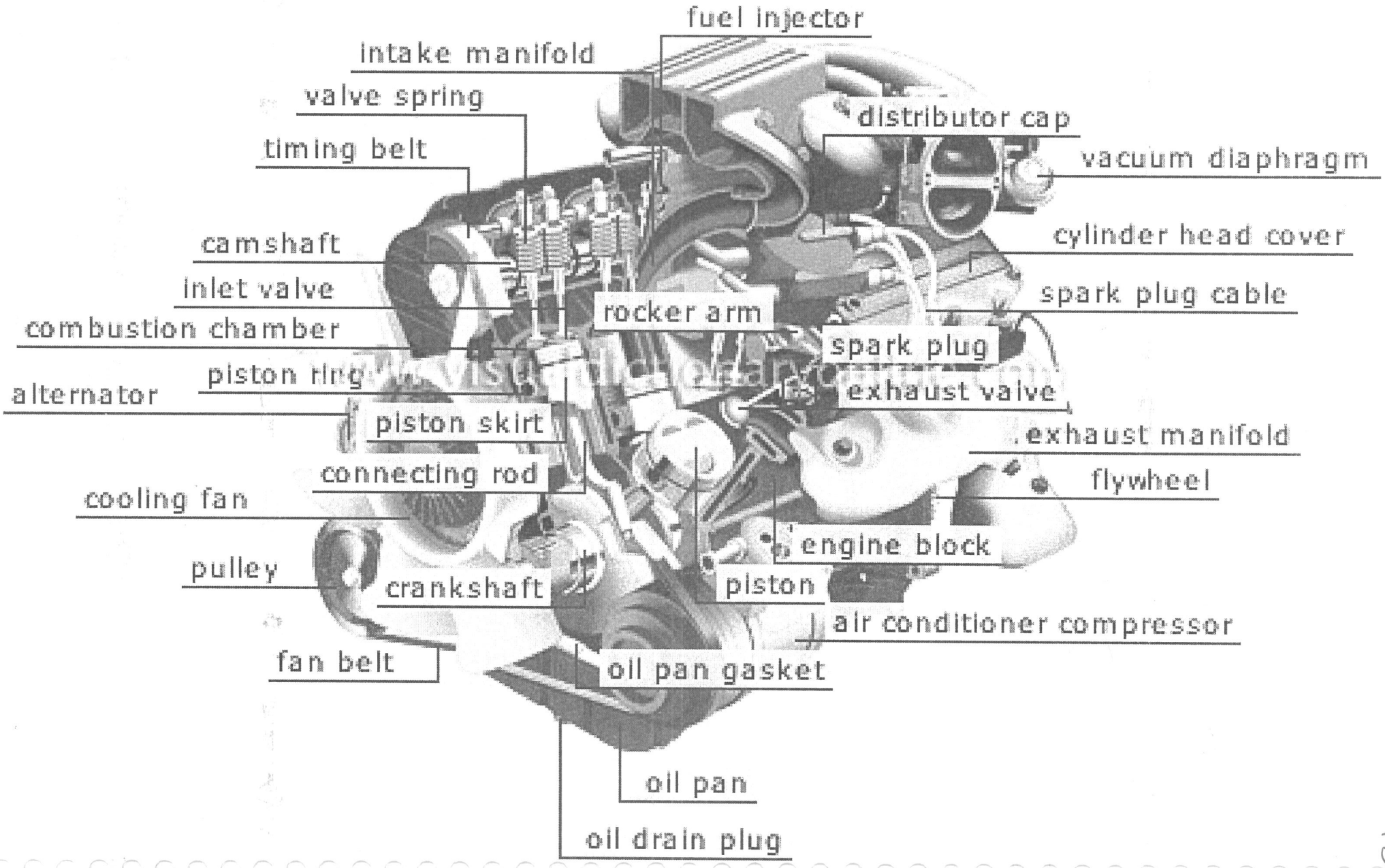


Train

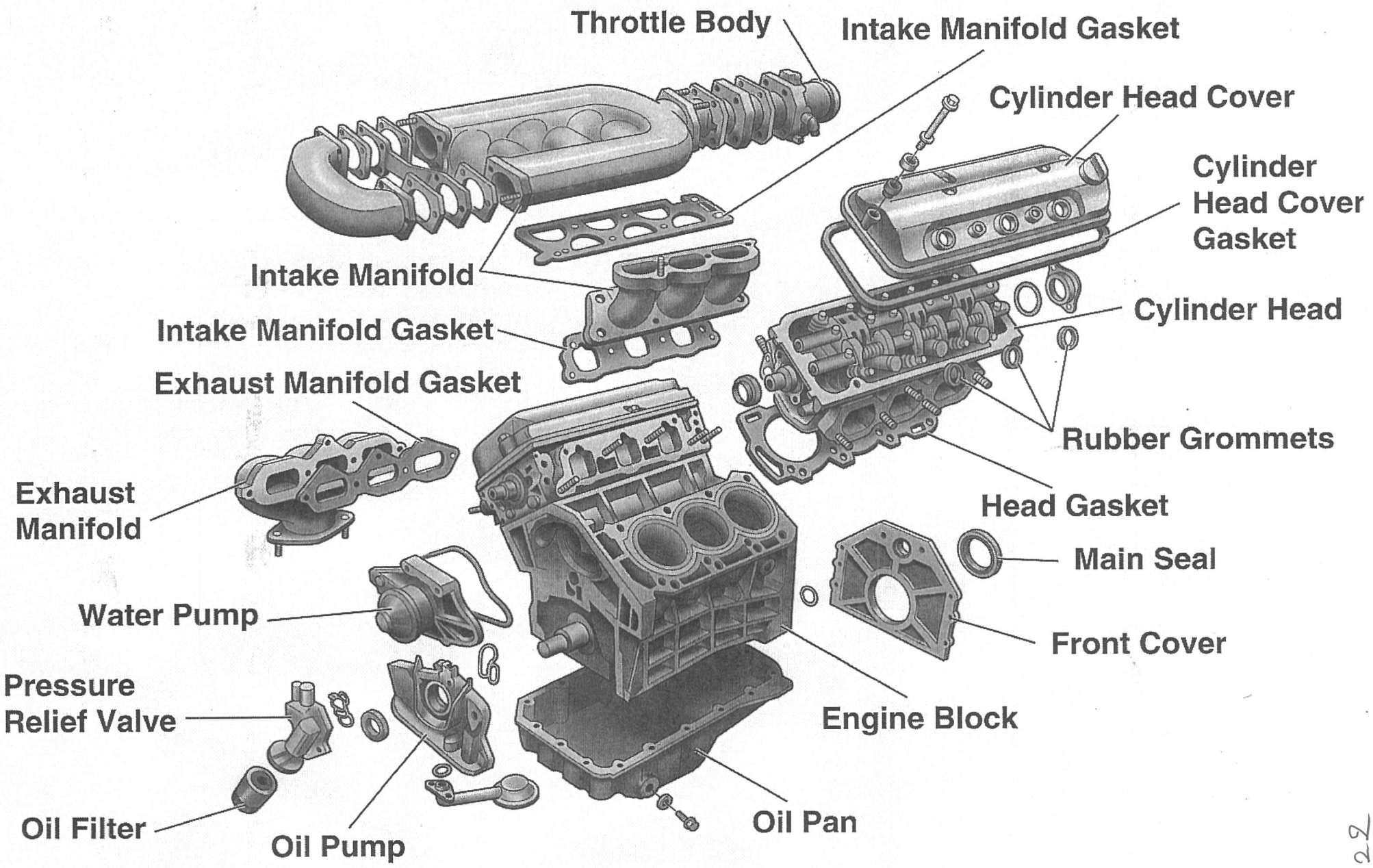
ठेला

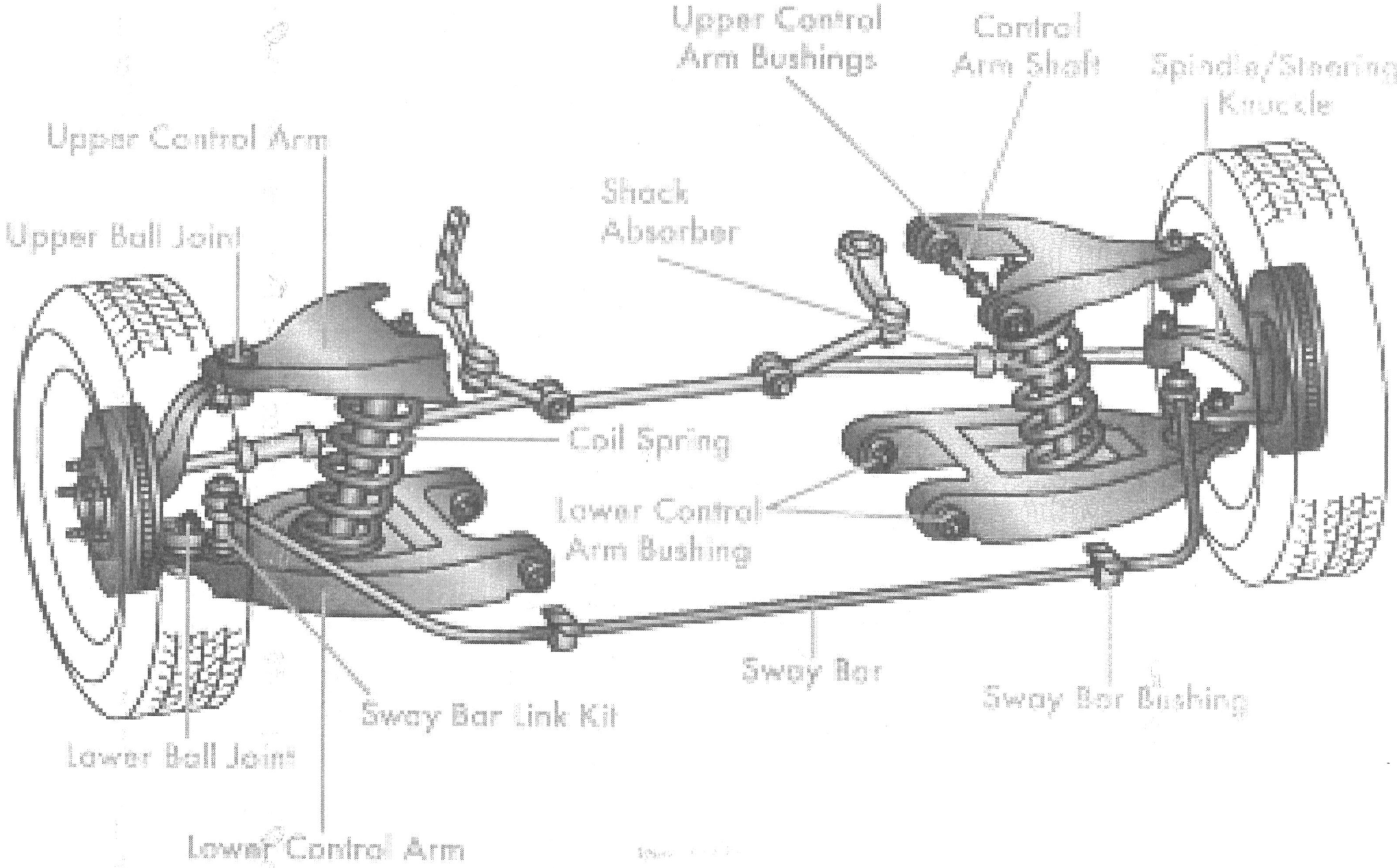


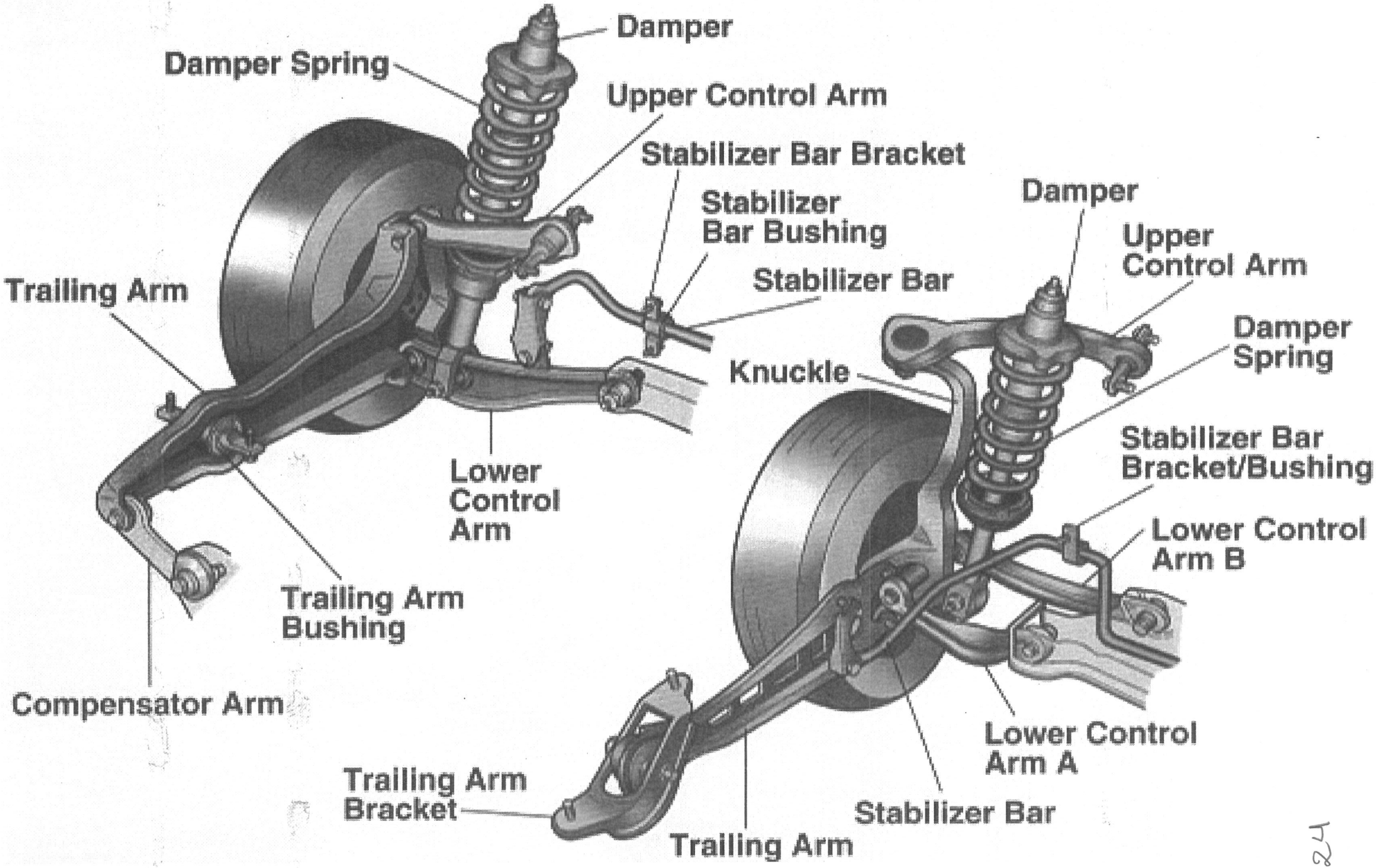
Hand Cart


fuel injector
intake manifold
valve spring
distributor cap
timing belt
vacuum diaphragm
camshaft
cylinder head cover
inlet valve
spark plug cable
rocker arm
combustion chamber
spark plug
piston ring
exhaust valve
alternator
piston skirt
exhaust manifold
connecting rod
flywheel
cooling fan
engine block
pulley
crankshaft
piston
air conditioner compressor
fan belt
oil pan gasket
oil pan
oil drain plug

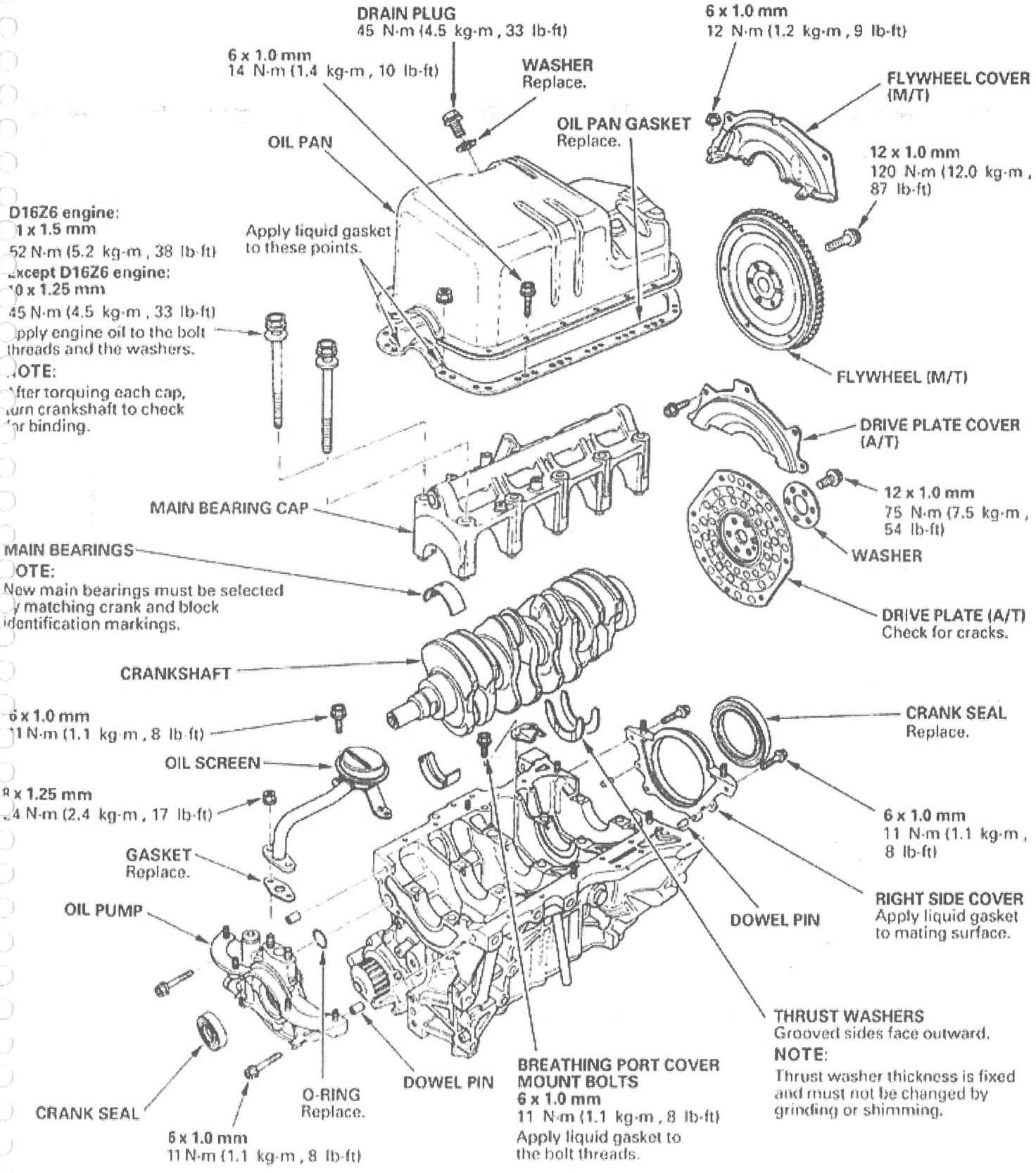
V6 Engine — Exploded View

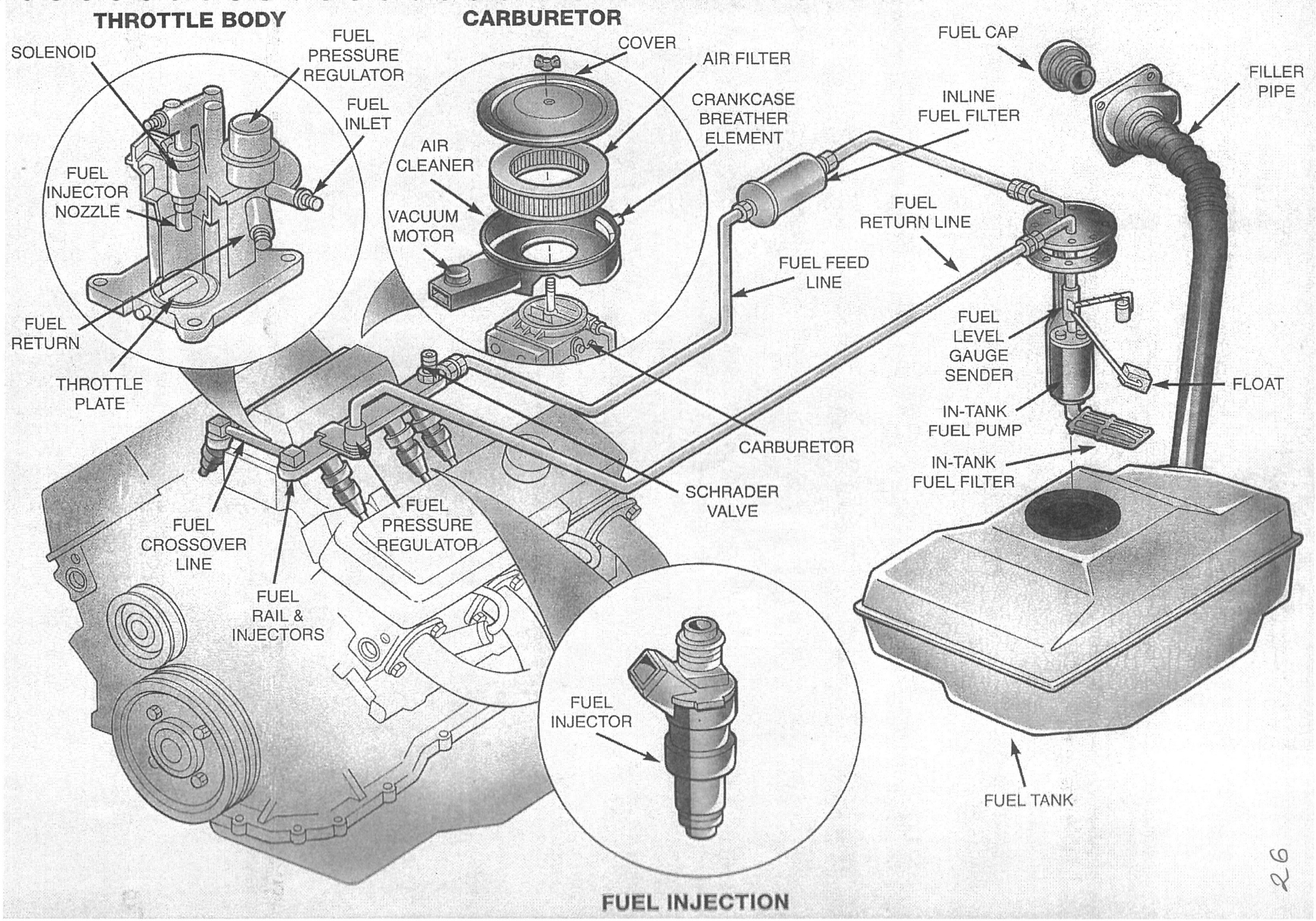



Upper Control Arm Bushings
Control Arm Shaft
Spindle/Steering Knuckle
Upper Control Arm
Upper Ball Joint
Shock Absorber
Coil Spring
Lower Control Arm Bushing
Sway Bar
Sway Bar Bushing
Sway Bar Link Kit
Lower Ball Joint
Lower Control Arm


Damper
Damper Spring
Upper Control Arm
Stabilizer Bar Bracket
Stabilizer Bar Bushing
Stabilizer Bar
Trailing Arm
Lower Control Arm
Trailing Arm Bushing
Compensator Arm
Damper
Upper Control Arm
Damper Spring
Knuckle
Stabilizer Bar Bracket/Bushing
Lower Control Arm B
Lower Control Arm A
Trailing Arm Bracket
Stabilizer Bar
Trailing Arm

NOTE:
• Apply liquid gasket to the mating surfaces of the right side cover and the oil pump before installing them.




THROTTLE BODY
SOLENOID
FUEL PRESSURE REGULATOR
FUEL INLET
FUEL INJECTOR NOZZLE
FUEL RETURN
THROTTLE PLATE
CARBURETOR
COVER
AIR FILTER
CRANKCASE BREATHER ELEMENT
AIR CLEANER
VACUUM MOTOR
FUEL CAP
FILLER PIPE
INLINE FUEL FILTER
FUEL RETURN LINE
FUEL FEED LINE
FUEL LEVEL GAUGE SENDER
FLOAT
IN-TANK FUEL PUMP
IN-TANK FUEL FILTER
CARBURETOR
SCHRADER VALVE
FUEL CROSSOVER LINE
FUEL PRESSURE REGULATOR
FUEL RAIL & INJECTORS
FUEL INJECTOR
FUEL TANK
FUEL INJECTION

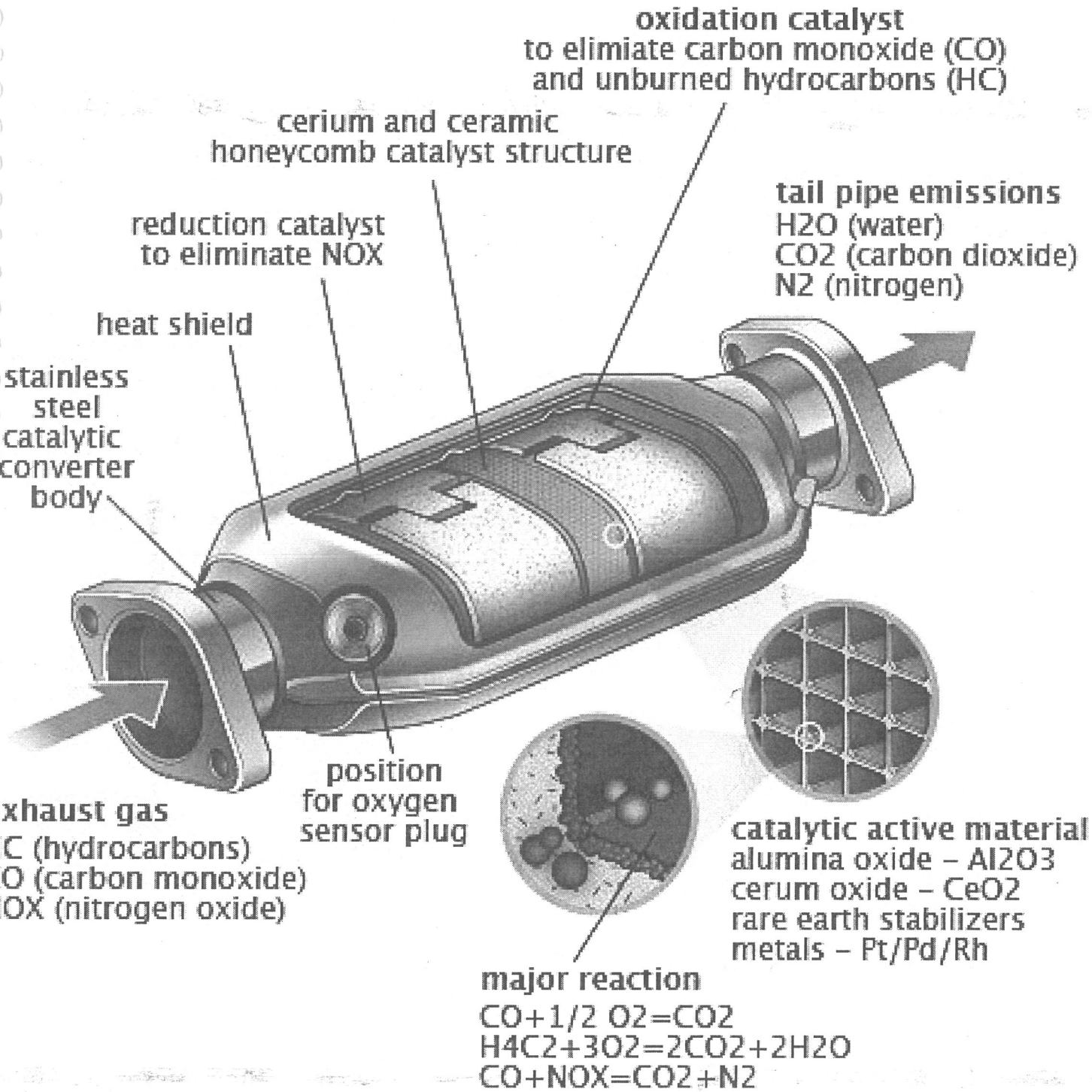
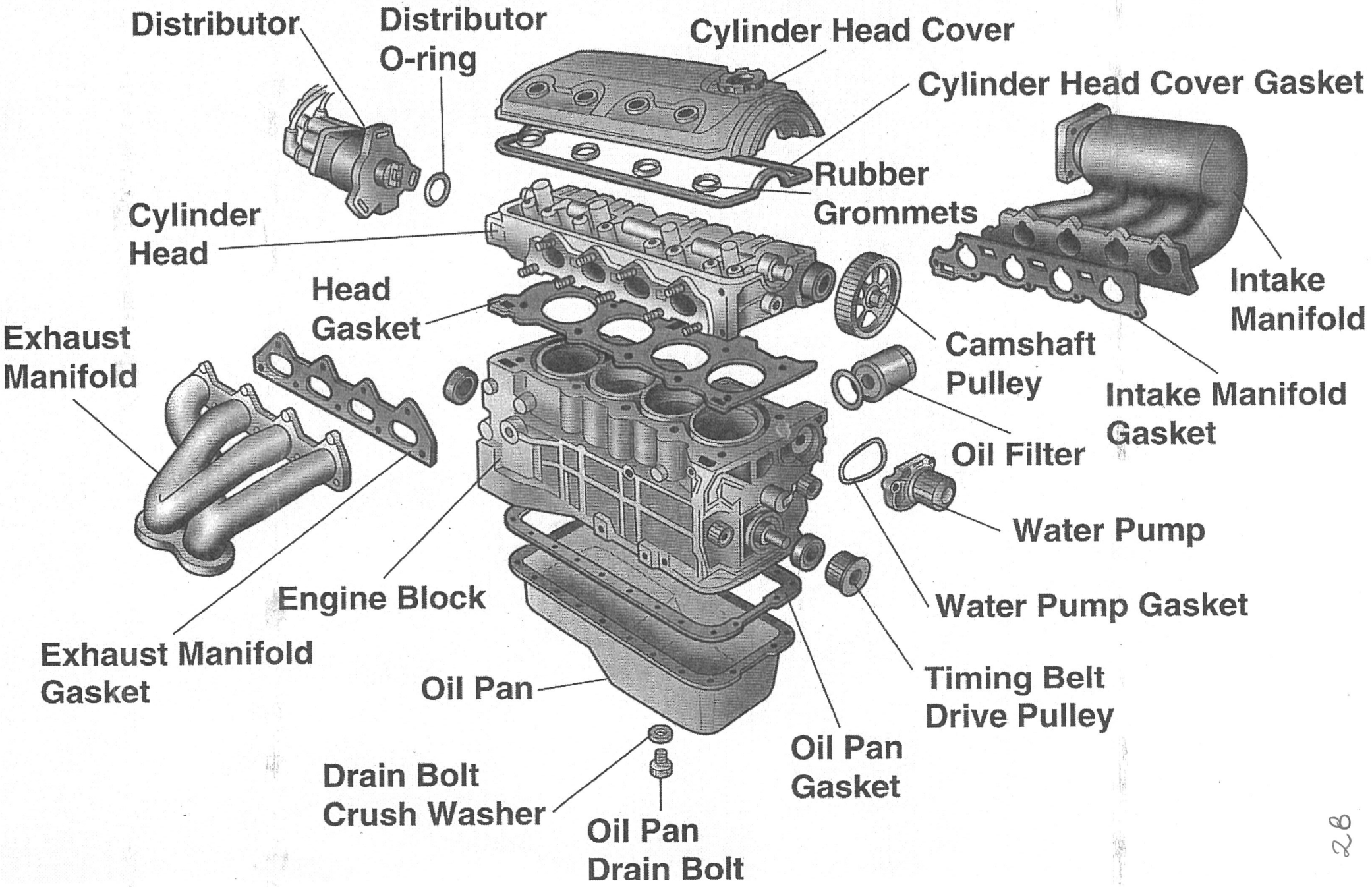
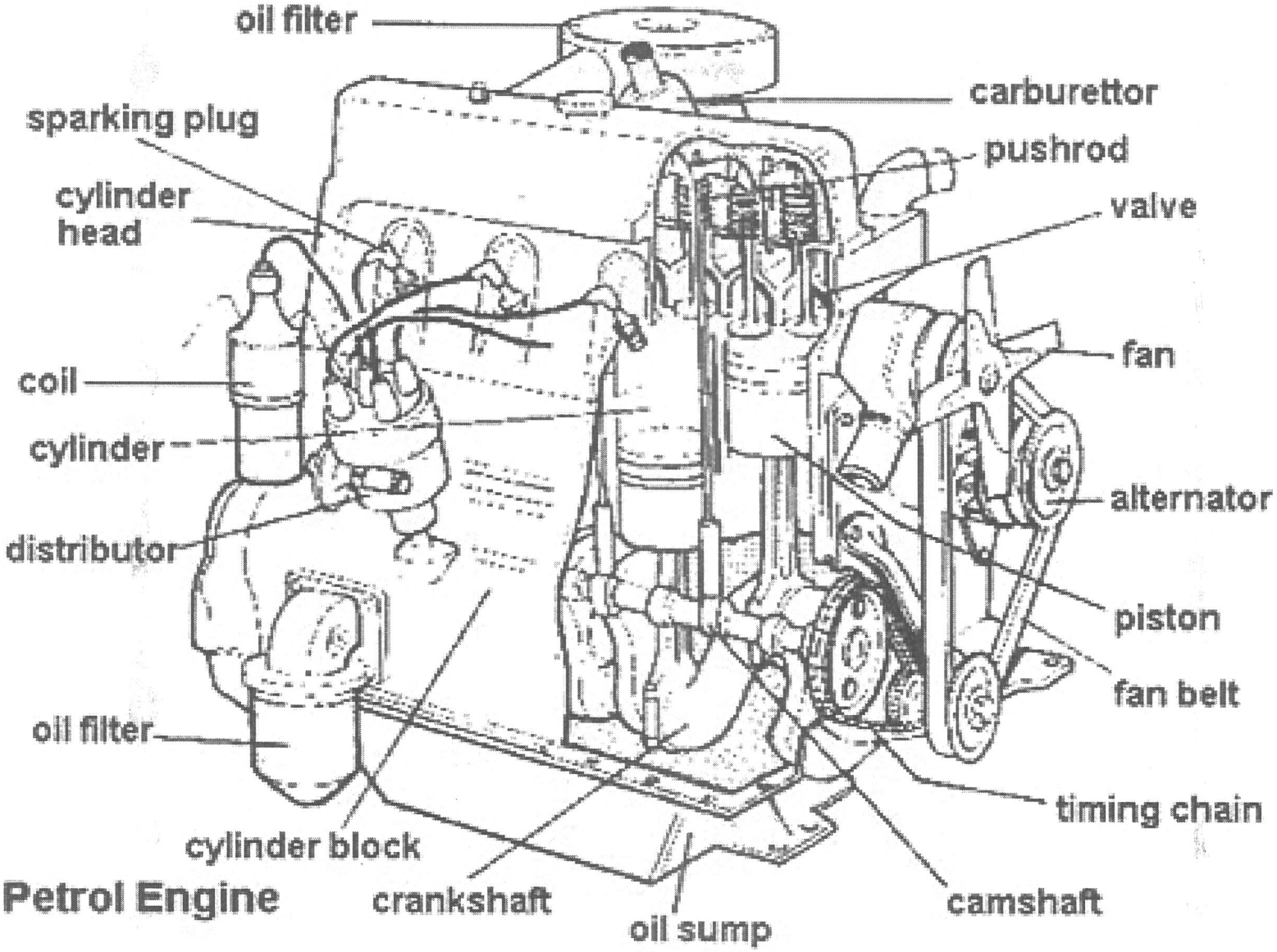


Image courtesy of ClearMechanic.com

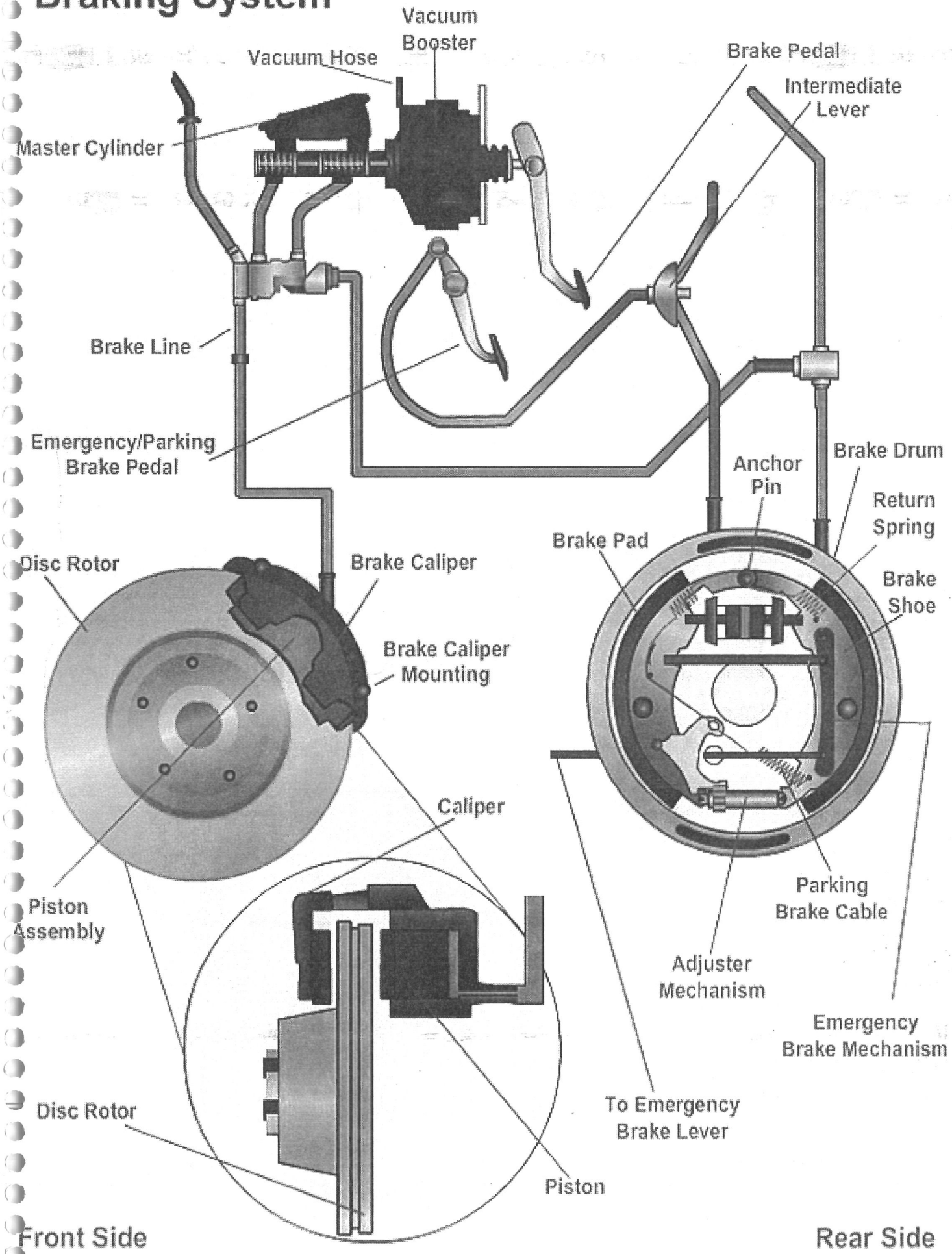
Engine (Exploded View)





Petrol Engine

Braking System



440) Intake air

441) Induction system

442) Insulation

443) Instrument panel unit

444) Instrument voltage regulator

445) Idle air bleed

446) Idle port

447) Idle mixture screw

448) Idle stop screw

449) Injector filter

450) Inner platinum electrode

451) Ignition delay

452) Indirect injection

453) In-line injection pump

454) Insulator

455) Ignition timing

456) Iron core

457) Insulator

458) Internal spline

459) Input shaft

460) Impeller

461) Input planetary gear set

440) هوای ورودی

441) سیستم هوا رسانی

442) عایث حرارتی

443) سوخت سنج داشبورد

444) تنظیم کننده ی فشار

445) رقیق کننده ی سوخت

446) مجرای پاشش سوخت دور آرام

447) پیچ تنظیم سوخت و هوای دور ارام

448) پیچ خاموش کن موتور

449) فیلتر انژکتور

450) الکترود داخلی (از جنس پلاتین)

451) تاخیر اشتعال

452) تزریق غیر مستقیم

453) پمپ انژکتور ردیفی

454) نارسانا

455) تایمینگ دلکو

456) هسته ی آهنی

457) عایق، نارسانا

458) هزار خار درونی

459) محور ورودی جعبه دنده

460) پره پمپ، پیش برنده سیال

461) دندانه های سیاره ی ورودی

462) Independent suspension

463) Insulator

464) Inflation pressure

465) Inter cooler

466) Intake manifold heater

467) Jackshaft

468) Journal diameter

469) Junction block

470) Joint pin

471) Jam nut

472) Key

473) Keyway

474) Knock sensor

475) Key (shifting plate, insert)

476) Knuckle

477) Knee bolster

462) تعلیق مستقل

463) لاستیک ضربه گیر

464) فشار باد لاستیک

465) خنک کن هوای ورودی موتور

466) گرم کن مانیفولد ورودی

467) محور محرک اویل پمپ

468) قطر محور

469) جعبه تقسیم

470) پین اتصال دهنده

471) مهره ی ضامن

472) خار، زبانه

473) جای خار

474) سنسور کوبش، سنسور ضربه

475) خار موشکی

476) سگ دست

477) بالش زانو

477) Laminated iron

478) Lining

479) Locking gear teeth

480) Low gear

481) Load

482) Lever

483) Lubricant level

484) Leaf spring

485) Lower control arm

486) Longitudinal torsion bar

487) Load range

488) Lower intake manifold

489) Low oil level sensor

490) Low compression engine

491) Length

492) Locating lug

477) آهن مورق (هسته ی آهنی وسط کویل)

478) لنت

479) دندانه های قفل کننده

480) دند سنگین

481) بار

482) اهرم

483) سطح روغن

484) فنر تخت

485) طبق پایین، اهرم کنترل پایین

486) فنر پیچشی طولی

487) حد بار گذاری

488) مانیفولد هوای بالایی

489) سنسور کمترین میزان روغن

490) موتور کم تراکم، موتور تراکم پایین

491) طول یاتاقان

492) زبانه ی قفل کننده ی یاتاقان

493) Lock washer

494) Lock nut

495) Lifter (tappet)

496) Lift

497) Low speed engine

498) L-head

499) Lead

500) Lag

501) Lubricant

502) Linkage

503) Lid

504) Lead particles

505) Low octane gasoline

506) Leaded gasoline

507) Light switch

508) Lighting system

509) Lead-acid battery

510) Laminations

493) واشر ضامن

494) مهره ی ضامن

495) تایپت

496) خیز بادامک، برخاستگی

497) موتور کم دور

498) موتور سوپاپ بغل

499)زود باز شدن سوپاپ

500) دیر بسته شدن سوپاپ

501)روانساز، روانکار

502) اهرم بندی، اتصال، میله ی رابط

503) در پوش

504) ذرات سرب

505) بنزین کم اکتان

506) بنزین سرب دار

507) کلید چراغ ها

508) سیستم روشنایی

509) باتری سربی – اسیدی

510) ورق های فلزی

511) Main bearing	511) یاتاقان ثابت، یاتاقان اصلی
512) Main bearing cap	512) کپه ی یاتاقان اصلی
513) Multi cylinder engine	513) موتور چند سیلندر
514) Mark	514) علامت، نشان
515) Minor thrust face	515) سمت کم فشار پیستون
516) Major thrust face	516) سمت پر فشار پیستون
517) Manufacturers mark	517) علامت کارخانه ی سازنده
518) Multi-valve engine	518) موتور چند سوپاپ
519) Margin	519) ضخامت لبه ی سوپاپ
520) Metering valve	520) سوپاپ اندازه گیری
521) Multi grade oil	521) روغن چهار فصل
522) Main oil gallery	522) مجرای الی توضیع روغن
523) Mechanical fuel pump	523) پمپ بنزین مکانیکی
524) Muffler	524) انباره ی اگزوز، صداگیر
525) Monolithic two-way catalyst	525) مبدل دو راهه (یک پارچه)
526) Metal line	526) لوله ی فلزی
527) Magnetic fuel gauge	527) سوخت سنج مغناطیسی
528) Magnet	528) آهن ربا
529) Metering rod	529) سوزن ژیگلور
530) Main metering jet	530) ژیگلور اصلی
531) Main nozzle	531) سوخت پاش اصلی
532) Main venturi	532) ونتوری اصلی
533) Manifold vacuum	533) خلاء مانیفولد

534) Mixture control unit

535) Microprocessor

536) Map sensor

537) Magnetic field

538) Movable point

539) Map sensor

540) Miniature bayonet

541) Multi-plate clutch

542) Main shaft

543) Mesh

544) Manual valve

545) Mac person strut

546) Maneuvering

547) Maneuverability

548) Maximum load

549) Mechanical

550Motion transfer

534) واحد کنترل کننده ی مخلوط

535) ریز پردازنده

536) سنسور فشار مانیفولد ورودی

537) میدان اهن ربایی

538) پلاتین متحرک

539) سنسور فسار مانیفولد هوا

540) لامپ کوچک

541) کلاچ چند صفحه ای

542) محور اصلی

543) درگیر

544) سوپاپ دستی

545) تعلیق مک فرسون

546) چرخانیدن فرمان

547) قابلیت چرخش فرمان (توان چرخش)

548) حداکثر بار

549) مکانیکی

550) انتقال حرارت

Abrivation

551) AA (Automobile Association)

شرکت اتومبیل

552) ABDC (After bottom dead center)

پس از نقطه ی مرگ پایین

553) ABS (Anti-lock braking system)

سیستم ترمز ضد قفل

554) AC (Alternating Current), (Air conditioning)

(جریان متناوب)، (تهویه مطبوع)

555) ACC (Adoptive Cruise Control)

انتخاب کنترل عمل کرد

556) ACT (Air Charge Temperature)

دمای هوای فشرده شده

557) A/D (Analogue Digital)

آنالوگ دیجیتال

558) ADC (Analog to Digital Convertor)

مبدل آنالوگ به دیجیتال

559) AFR (Air Fuel Ratio)

نسبت سوخت و هوا

560) AFM (Air Flow Meter)

سنجیدن جریان هوا

561) AH (Ampere – Hour)

آمپر – ساعت

562) API (American Petroleum Institute)

موسسه ی نفت خام آمریکایی

563) APRA (Automotive Parts Rebuilders Association)

قسمت های به هم پیوسته ی خودرو

564) ASE (Automotive Service Excellence)

تعمیر پذیری خودرو

565) ASME (American Society of Mechanical Engineers)

انجمن مهندسین مکانیک آمریکا

566) ASTM (American Society for Testing Materials)

انجمن آمریکایی برای تست مواد

567) ATC (Automatic Temperature Control)

کنترل اتوماتیک دما

568) ATDC (After Top Dead Center)

پس از نقطه ی مرگ بالا

569) ATF (Automatic Transmission Fluid)

ارسال اتوماتیک سیال

570) ATS (Air Temperature Sensor)

حسگر دمای هوا

571) AWD (All Wheel Drive)

تمام چرخ محرک

572) AWG (American Wire Gauge System)

مقیاس اندازه گیری آمریکایی

573) BA (British Association)

شرکت بریتانیایی

574) BAP (Barometric Air Pressure)

فشار هوای بارو متری

575) BBDC (Before Bottom Dead Center)

قبل از نقطهی مرگ پایین

576) BCDD (Boost Controlled Deceleration Device)

ترقی دادن فشار منفی وسیله

577) BDC (Bottom Dead Center)

نقطه ی مرگ پایین

578) BHP (Brake Horse Power)

نیروی ترمز بر حسب اسب بخار

579) BMEP (Brake Mean Effective Pressure)

مقدار محاسبه شده متوسط فشار در سیلندر در مرحله قدرت

580) BP (Brake Power)

قدرت ترمز

581) BPS (Boost Pressure Sensor)

سنسور بالا بردن فشار

582) BS (British Standard)

استاندارد بریتانیایی

583) BSF (British Standard Fine)

ظرافت استاندارد بریتانیایی

584) BSFC (Brake specific Fuel Consumption)

مقدار سوخت مصرف شده در واحد زمان برای تولید واحد قدرت

585) BSI (British Standards Inistitution)

موسسه استاندارد بریتانییی

586) BSI (Built in System Interface)

اتصال بین اجزای پیش ساخته

587) BSW (British Standard Whitworth)

ارزش استانداردبریتانیایی

588) BTDC (Before Top Dead Center)

قبل از نقطه ی مرگ بالا

589) BTU (British Thermal Unit)

واحد گرمایی بریتانیایی

590) CAD (Computer – Aided Design)

طراحی به کمک کامپیوتر

591) CAFE (Corporate Average Fuel Economy)

میانگین صنفی در اقتصاد سوخت

592) CAM (Computer Aided Manufacturing)

تولید به کمک کامپیوتر

593) CAN (Controller Area Network)

کنترل حوضه ی شبکه

594) CB (Contact Breaker)

کلید قطع کننده

595) CCA (Cold Cranking Amperes)

مقدار سرد کردن میل لنگ

596) CCC (Computer Command Control)

کنترل کننده ی دستورات کامپیوتری

597) CCC (Combustion Control Computer)

کنترل سوخت کامپیوتری

598) CDI (Capacitor – Discharge Ignition)

سیستم احتراق با انرژی زیاد

599) CPFI (Center Point Fuel Injection)

سوزن انژکتور با سوراخ در وسط

600) CFI (Central Fuel Injection)

سوزن انژکتور مرکزی

601) CFRC (Cooperative Fuel Research Committee)

شرکت بررسی تحقیقات در مورد سوخت

602) CI (Compression Ignition)

تراکم احتراقی

603) CID (Cubic Inch Displacement)

تغییر مکان مکعبی

604) CIH (Camshaft in Head)

میل بادامک رو

605) CIM (Computer Integrated Manufacturing)

تولید یکپارچه کامپیوتری

606) CIS (Continuous Injection System)

سیستم تزریق پیوسته

607) CKD (Complete Knock Down)

ضربه زدن کامل

608) CN (Cetane Number)

عدد ستان

609) CNG (Compressed Natural Gas)

گاز فشرده شده ی طبیعی

610) CO (Carbon Monoxide)

مونواکسید کربن

611) CP (Constant Pressure)

فشار ثابت

612) CP (Could Point)

نقطه ی توانستن

613) CPD (Could Point Depressant)

نقطه ی کاهش فعالیت

614) CPI (Central Port Injection)

درگاه تزریق مرکزی

615) CPU (Central Processing Unit)

واحد پردازش مرکزی

616) CR (Compression Ratio)

ضریب تراکم

617) CRC (Coordinating Research Council)

هماهنگ کردن تحقیقات شورا

618) CRT (Cathode Ray Tube)

لامپ اشعه کاتدی

619) CSI (Cold Start Injection)

انژکتور روشن کردن در حالت سرد

620) CTO (Coolant Temperature over Drive)

دمای ماده ی خنک کننده بعد از مدتی

621) CTS (Coolant Temperature Sensor)

سنسور دمای ماده ی خنک کننده

622) CV (Constant Velocity)

سرعت ثابت

623) CV (Calorific Value)

ارزش گرمایی

624) CV (Constant Volume)

مقدار ثابت

625) CVCC (Compound Vortex Controlled Combustion)

مقدار ثابتسوخت کنترل شده ی با ماده ی مرکب

626) CVT (Continuously Variable Transmission)

همیشه متغیر بودن ارسال

627) DAR (Drive Axle Ratio)

نسبت محرک بودن محور انتقال

628) DC (Direct Current)

جریان مستقیم

629) DELCO (Daton Engineering Leboratories Company)

دستگاه تقسیم کننده برق

630) DFI (Direct Fuel injection)

سیستم تزریق مستقیم سوخت

631) DI (Direct Injection)

تزریق مستقیم

632) DIS (Distributor less Ignition System)

سیستم احتراق موتور بدون چکش برق

633) DIS (Direct Ignition System)

سیستم احتراق موتور مستقیم

634) DLC (Delta Link Connector)

کانکتور خط دلتا

635) DOC (Double – Overhead – Camshaft)

میل بادامک رو دوتایی

636) DOT (Department Of Transportation)

انتقال قسمت های مختلف

637) DTC (Diagnostic Trouble Code)

خطایابی کد های مخرب

638) EBS (Electronic Braking System)

سیستم ترمز الکترونیکی

639) ECE (Economic Commission for Europe)

هیئت اقتصادی اروپا

640) ECM (Electronic Control Module)

مدول کنترل الکترونیکی

641) ECT (Engine Coolant Temperature)

دمای ماده سرد کننده موتور

642) ECU (Electronic Control Unit)

واحد کنترل الکترونیکی

643) EDC (Electronic Diesel Control)

کنترل الکترونیکی موتور دیزلی

644) EEC (Electronic Engine Control)

کنترل الکترونیکی موتور

645) EFC (Electronic Feedback Carburator)

کنترل الکترونیکی پس زدن کاربراتور

646) EFE (Early Fuel Evaporation)

تبخیر زود هنگام سوخت

647) EFI (Electronic Fuel Injection)

تزریق سوخت الکترونیکی

648) EGO (Exhaust Gas Oxygen)

اکسیژن خروجی از اگزوز

649) EGR (Exhaust Gas Recirculation)

نسبت گازهای خروجی از اگزوز

650) EMI (Electro Magnetic Interference)

تداخل امواج به صورت الکترو مغناطیسی

651) EMS (Engine Management System)

سیستم مدیریت موتور

652) EOS (Exhaust Oxygen Sensor)

سنسور اکسیژن

653) EP (Extreme Pressure)

حد نهایی فشار

654) EPS (Electronic Power Steering)

فرمان خود کار الکترونیکی

655) ESA (Electronic Spark Advance)

آواس جرقه الکترونیکی

656) ESC (Electronic Spark Control)

کنترل الکترونیکی جرقه

657) ESD (Electro Static Discharge)

تخلیه الکترونیکی استاسیکی

658) ESP (Electronic Stability Program)

استقرار برنامه ها به صورت الکترونیکی

659) EST (Electronic Spark Timing)

میزان کردن الکترونیکی جرقه

660) ETC (Electronic Throttle Control)

کنترل الکترونیکی خفه کردن

661) EVC (Exhaust Valve Closed)

بسته بودن سوپاپ دود

662) EVO (Exhaust Valve Open)

باز بودن سوپاپ دود

663) FBC (Feedback Carburettor)

پس زدن کاربراتور

664) FD (Final Drive)

گرداننده ی نهایی

665) FEM (Finite Element Method)

روش المان محدود

666) FHP (Frictional Horse power)

اصطکاک مالشی بر حسب اسب بخار

667) FICD (Fuel Injection Control Device)

دستگاه کنترل تزریق سوخت

668) FP (Friction Power)

قدرت اصطکاک

669) FWD (Four Wheel Drive)

چهار چرخ محرک

670)FWD (Front Wheel Drive)

چرخ های جلو محرک

671) FWS (Four Wheel steering)

چهار چرخ فرمان پذیر

672) GDI (Gasoline Direct Injection)

تزریق مستقیم بنزین

673) GP (Gross Power)

فشار یک پارچه

674) GPM (Grams Per Mile)

گرم بر مایل

675) GVW (Gross Vehicle Weight)

وزن یک پارچه خودرو

676) HC (Hydro Carbon)

هیدرو کربن

677) HD (Heavy Duty)

مخصوص کار سنگین

678) HEGO (Heated Exhaust Gas Oxygen)

گرم شدن اکسیژن خروجی

679) HEGOS (Heated Exhaust Gas Oxygen Sensor)

سنسور دمای اکسیژن خروجی از اگزوز

680) HEI (High Energy Ignition System)

سیستم احتراق موتور پر انرژی

681) HEPA (High Efficiency Particulate Air Filter)

فیلتر دارای ذرات ریز با راندمان بالا

682) HFM (Hot Film Air Mass Meter)

نشان دهنده توده ی نازکی از هوای گرم

683) HP (Horse Power)

اسب بخار

684) HSS (High Strength Steel)

فولاد با استحکام بالا

685) HT (High Tension)

فشار قوی

686) HVI (High Viscosity Index)

چسبندگی زیاد

687) HV (Heat Value)

ارزش گرمایی

688) IAC (Idle Air Control)

کنترل هوای دور آرام

689) IAT (Intake Air Temperature)

دمای هوای ورودی

700) IC (Integrated Circuit)

مدار مجتمع

701) ICE (Internal Combustion Engine)

موتور احتراق داخلی

702) ICEI (Internal Combustion Engine Institute)

موسسه موتور احتراق داخلی

703) ICM (Ignition Control Module)

مدول کنترل احتراق

704) IDI (In Direct Injection)

تزریق مستقیم درونی

705) IHP (Indicated Horse Power)

نشان دادن بر حسب نیروی اسب

706) IMEP (Indicated Mean Effective Pressure)

نشان دادن فشار موثر متوسط

707) IP (Indicated Power)

نشان دادن فشار

708) IRS (Independent Rear Suspension)

تعلیق مستقل عقب

709) ISC (Idle Speed Control)

کنترل سرعت دور آرام

710) ISFC (Indicated Specific Fuel Consumption)

نشان دادن مصرف سوخت ویژه

711) ISO (International Standards Organization)

سازمان استانداردهای بین المللی

712) IVC (Inlet Valve Closed)

سوپاپ ورودی بسته

713) IVO (Inlet Valve Open)

سوپاپ ورودی باز

714) IVR (Instrument Voltage Regulator)

دستگاه اندازه گیری تنظیم کننده ولتاژ

715) JPI (Japanese Petroleum Institute)

موسسه ی نفت خام ژاپنی

716) JIT (Just In Time)

به موقع

717) KAM (Keep Alive Memory)

نگه داشتن حافظه ی روشن

718) KD (Knock Down)

زدن به پایین

719) KPI (King Pin Inclination)

انحراف گژن پین

720) KS (Knock Sensor)

سنسور ضرب

721) KWH (Kilowatt Hour)

کیلو وات – ساعت

722) LDT (Light Duty Trucks)

چراغ بزرگ کامیون

723) LED (Light Emitting Diode)

دیود نوری

724) LEV (Low Emission Vehicle)

تشعشع کم در وسیله

725) LHD (Left Hand Drive)

فرمان به سمت چپ

726) LOS (Limited Operation Strategy)

عملیات و استراتژی محدود شده

727) LT (Light Truck)

چراغ کامیون

728) LT (Low Tension)

فشار ضعیف

729) LVI (Low Viscosity Index)

دارای ویسکوزیته کم

730) MAF (Mass Air Flow)

418) Hydro carbon

419) Ignition distributor

420) Induction stroke

421) Ignition stroke

422) Inlet tube assembly

423) Internal combustion engine

424) In-line engine

425) Intermediate main bearing

426) Inner ring

427) Intake valve

428) Intake port

429) Inner valve spring

430) Integral seat

431) Idler pulley (flat-head)

432) I-head (overhead valve)

433) Inner rotor

434) Ignition switch

435) Indication light on dash

436) Inlet tank

437) Impeller

438) Insulator

439) Inside air

418) هیدرو کربن

419) دلکو

420) مرحله ی مکش

421) مرحله ی کار

422) لوله ی ورود روغن به پمپ

423) موتور احتراق داخلی

424) موتور ردیفی، موتور خطی

425) یاتاقان اصلی میانی

426) حلقه ی داخلی

427) سوپاپ ورودی

428) مجرای ورود سوخت و هوا

429) فنر کوچک سوپاپ

430) سیت یک پارچه

431) پولی هرزگرد

432) موتور سوپاپ رو

433) روتور داخلی

434) سوئیچ

435) لامپ هشدار دهنده روی داشبورد

436) منبع ورودی، مخزن بالای رادیاتور

437) پره های پمپ

438) نا رسانا

439) هوای داخل

396) Head bolt

397) Horizontal engine

398) High compression engine

399) Hub

400) Heat dam

401) Hydraulic valve lifter

402) Hemispherical combustion chamber

403) Head (valve head)

404) Heel

405) Hollow stud

406) High speed engine

407) Helical drive gear

408) Heater core

409) Heater hoses

410) Heat exchanger (oil cooler)

411) Heat transfer

412) Hose clamp

413) Heat energy

414) Hose

415) Heat capacity

416) Hot air pipe

417) Hanger

396) پیچ سرسیلندر

397) موتور افقی، موتور پیستون افقی

398) موتور پر تراکم، موتور تراکم بالا

399) توپی

400) سد حرارتی

401) تایپت هیدرولیکی

402) محفظه ی احتراق نیم کروی

403) سر سوپاپ

404) قسمت دایره ای

405) پیچ تو خالی

406) موتور پر دور

407) چرخ دنده مارپیچی

408) شبکه ی بخاری

409) لوله های بخاری

410) خنک کننده ی روغن

411) انتقال حرارت

412) بست شیلنگ

413) انرژی حرارتی

414) شیلنگ

415) ظرفیت گرمایی

416) لوله ی ورودی هوای گرم

417) آویز، بست

Stress-strain diagram

A schematic diagram for the stress-strain curve of low carbon steel at room temperature is shown in figure 2. There are several stages showing different behaviors, which suggests different mechanical properties. To clarify, materials can miss one or more stages shown in figure 2, or have totally different stages.

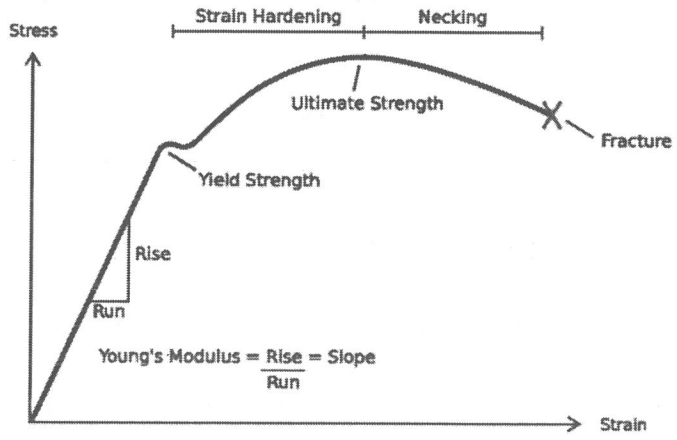
The first stage is the linear elastic region. The stress is proportional to the strain, that is, obeys the general Hooke's law, and the slope is Young's modulus. In this region, the material undergoes only elastic deformation. The end of the stage is the initiation point of plastic deformation. The stress component of this point is defined as yield strength (or upper yield point, UYP for short).

The second stage is the strain hardening region. This region starts as the strain goes beyond yielding point, and ends at the ultimate strength point, which is the maximal stress shown in the stress-strain curve (tensile strength, T.S., also sometimes referred to as the ultimate tensile strength, D.T.S.). In this region, the stress mainly increases as material elongates, except that there is a nearly flat region at the beginning. The stress of the flat region is defined as the lower yield point (LYP) and results from the formation and propagation of Lüders bands.

Explicitly, heterogeneous plastic deformation forms bands at the upper yield strength and these bands carrying with deformation spread along the sample at the lower yield strength. After the sample is again uniformly deformed, the increase of stress with the progress of extension results from work strengthening, that is, dense dislocations induced by plastic deformation hampers the further motion of dislocations. To overcome these obstacles, a higher resolved shear stress should be applied. As the strain accumulates, work strengthening gets reinforced, till the stress reaches the tensile strength.

The third stage is the necking region. Beyond tensile strength, a *neck* forms where the local cross-sectional area becomes significantly smaller than the average. The necking deformation is heterogenous and will reinforce itself as the stress concentrates more at small section. Such positive feedback leads to quick development of necking and leads to fracture.

Note that though the pulling force is decreasing, the work strengthening is still progressing, that is, the true stress keeps growing but the engineering stress decreases because the shrinking section area is not considered. This region ends up with the fracture. After fracture, percent elongation and reduction in section area can be calculated.



Ductile materials, which includes structural steel and many alloys of other metals, are characterized by their ability to yield at normal temperatures.

Low carbon steel generally exhibits a very linear stress–strain relationship up to a well-defined yield point . The linear portion of the curve is the elastic region and the slope is the modulus of elasticity or Young's Modulus .

Many ductile materials including some metals, polymers and ceramics exhibit a yield point. Plastic flow initiates at the upper yield point and continues at the lower one. At lower yield point, permanent deformation is heterogeneously distributed along the sample.

The deformation band which formed at the upper yield point will propagate along the gauge length at the lower yield point. The band occupies the whole of the gauge at the luders strain. Beyond this point, work hardening commences. The appearance

of the yield point is associated with pinning of dislocations in the system. For example, solid solution interacts with dislocations and acts as pin and prevent dislocation from moving. Therefore, the stress needed to initiate the movement will be large. As long as the dislocation escape from the pinning, stress needed to continue it is less.

After the yield point, the curve typically decreases slightly because of dislocations escaping from Cottrell atmospheres. As deformation continues, the stress increases on account of strain hardening until it reaches the ultimate tensile stress. Until this point, the cross-sectional area decreases uniformly because of Poisson contractions. Then it starts necking and finally fractures.

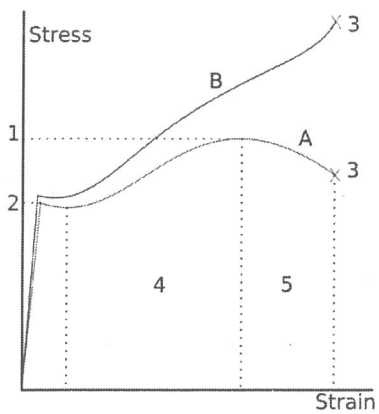
The appearance of necking in ductile materials is associated with geometrical instability in the system.

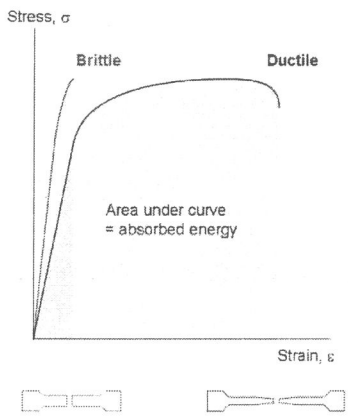
Due to the natural inhomogeneity of the material, it is common to find some regions with small inclusions or porosity within it or surface, where strain will concentrate, leading to a locally smaller area than other regions. For strain less than the ultimate tensile strain, the increase of work-hardening rate in this region will be greater than the area reduction rate, thereby make this region harder to be further deform than

others, so that the instability will be removed, i.e. the materials have abilities to weaken the inhomogeneity before reaching ultimate strain.

However, as the strain become larger, the work hardening rate will decreases, so that for now the region with smaller area is weaker than other region, therefore reduction in area will concentrate in this region and the neck becomes more and more pronounced until fracture. After the neck has formed in the materials, further plastic deformation is concentrated in the neck while the remainder of the material undergoes elastic contraction owing to the decrease in tensile force.

The stress-strain curve for a ductile material can be approximated using the Ramberg-Osgood equation. This equation is straightforward to implement, and only requires the material's yield strength, ultimate strength, elastic modulus, and percent elongation.





$$CB = OB - OC = \sigma_x - \frac{\sigma_x + \sigma_y}{2} = \frac{\sigma_x - \sigma_y}{2}$$

$$BA = \tau$$

$$R^2 = CA^2 = CB^2 + AB^2 = \left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + \tau^2 \qquad (10\text{-}9a)$$

The radius is identical to that given in Eq. (10-7*c*).

Stress at location P: The two stress components at this location are

$$\sigma_p = \sigma_1 = \sigma'_x = \frac{\sigma_x + \sigma_y}{2} - \sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + \tau^2}$$

$$\tau_p = 0$$

$$\tan 2\theta_p = \frac{AB}{BC} = \frac{\tau}{(\sigma_x - \sigma_y)/2} = \frac{2\tau}{(\sigma_x - \sigma_y)} \qquad (10\text{-}9b)$$

Location *P* corresponds to the first principal stress (σ_1) with zero shear stress ($\tau = 0$).

Stress at location Q: The two stress components at this location are

$$\sigma_q = \sigma_2 = \sigma'_y = \frac{\sigma_x + \sigma_y}{2} + \sqrt{\frac{(\sigma_x - \sigma_y)^2}{2} + \tau^2}$$

$$\tau_q = 0$$

$$\tan(2\theta_q = 180^\circ + 2\theta) = \frac{2\tau}{(\sigma_x - \sigma_y)} \qquad (10\text{-}9c)$$

Location *Q* corresponds to the second principal stress (σ_2) with zero shear stress ($\tau = 0$).

Angles θ_p and θ_q of the principal directions are calculated by using the trigonometric identity ($\tan 2\theta = \tan(180^\circ + 2\theta)$), or the angle ($\theta$) differs by 90°. If the principal stress at *P* is ($\sigma_p = \sigma_1$), with the orientation θ_p, then the second principal stress at *Q* is $\sigma_q = \sigma_2$, with the orientation $\theta_p + 90^\circ$. The principal stresses (σ_1 and σ_2) are oriented along mutually perpendicular directions.

Stress at location S: The location *S* and T in Fig. 10-8 correspond to the maximum shear stress. The magnitude of shear stress is equal to the radius *R*. Normal stress (σ_{ns}) is present, and its value is equal to the average stress [$\sigma_{ns} = \sigma_a = (\sigma_x + \sigma_y)/2$].

At location *S*, the stresses are

$$\tau_s = -\tau_{max} = -R = -\sqrt{\frac{(\sigma_x - \sigma_y)^2}{2} + \tau^2}$$

$$\sigma_{ns} = \frac{(\sigma_x + \sigma_y)}{2}$$

have derived analytically. Mohr's circle for a given stress state (σ_x, σ_y, τ) is constructed in the following steps.

Step 1—Mark the Axes

Consider an arbitrary point (O) as the origin of the coordinate system. The x-coordinate represents the normal stress (σ'_x) as shown in Fig. 10-8. The y-coordinate represents the shear stress (τ') in the same face, but traditionally this coordinate is marked downward. The angle of rotation (2θ) is positive when it is in the counterclockwise direction. The Mohr circle uses twice the rotation (2θ).

Step 2—Mark C as the Origin of the Mohr's Circle

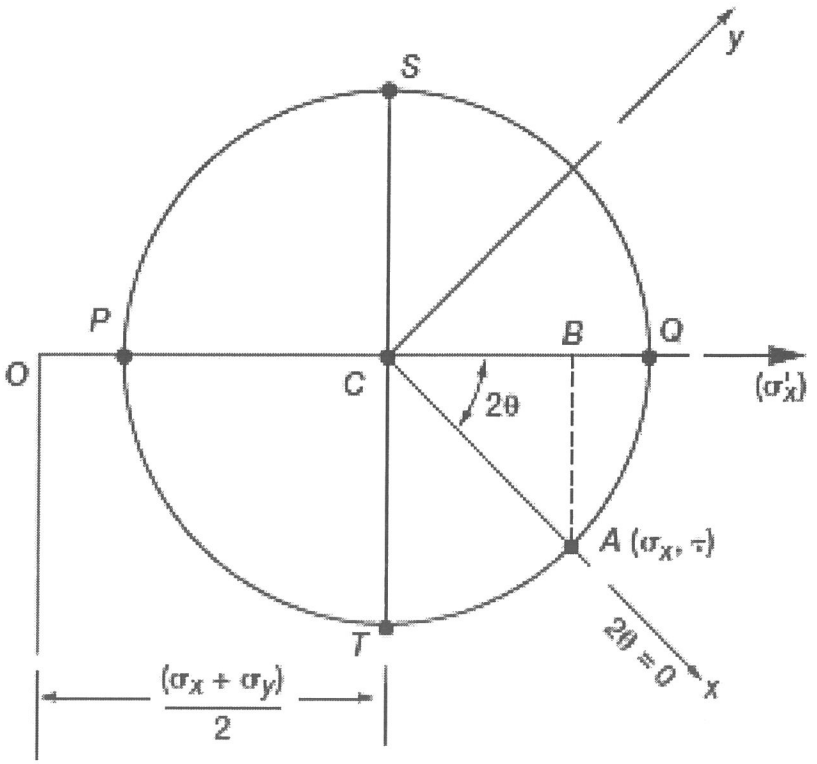
The origin C lies in the x-coordinate axis at a specified distance [$\sigma_a = 0.5(\sigma_x + \sigma_y)$] from the origin O.

Step 3—Draw the Circle

The calculation of the radius R from Eq. (10-7*c*) is avoided. Instead, a point A is located on the circumference. This point corresponds to the given stress state (σ_x, σ_y, τ), which has zero rotation ($2\theta = 0$). Mark point A (σ_x, τ) with the x-coordinate as ($\sigma_x = OB$) and the y-coordinate as ($\tau = BA$). Draw a circle with an origin at C and a radius R equal to CA. The original x-coordinate axis is the line joining C and A, and the y-axis is perpendicular to it. The angle 2θ is measured from A in the counterclockwise direction. It is zero ($2\theta = 0$) at A.

The Mohr's circle provides the following information.

Radius (R) of the Mohr's circle: The radius is obtained by applying the Pythagorean theorem to the right triangle CBA.



10.5 Mohr's Circle for Plane Stress

Otto Mohr in 1882 suggested a graphical method to calculate principal stress. This method is based on the first two formulas given in Eq. (10-3*g*). The two formulas are rearranged to obtain

$$\sigma'_x(\theta) - \frac{\sigma_x + \sigma_y}{2} = \frac{\sigma_x - \sigma_y}{2}\cos 2\theta + \tau \sin 2\theta$$

$$\tau'(\theta) = -\frac{\sigma_x - \sigma_y}{2}\sin 2\theta + \tau \cos 2\theta \qquad (10\text{-}7a)$$

Square both equations, add, and simplify to obtain

$$\left(\sigma'_x(\theta) - \frac{\sigma_x + \sigma_y}{2}\right)^2 + \tau'(\theta)^2 = \left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + \tau^2 \qquad (10\text{-}7b)$$

Define an average stress (σ_a) and a radius (R) as

$$\sigma_a = \frac{\sigma_x + \sigma_y}{2}$$

$$R^2 = \left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + \tau^2 \qquad (10\text{-}7c)$$

Equation (10-7*b*) is rewritten using the average stress and radius to obtain

$$\left(\sigma'_x - \sigma_a\right)^2 + \tau'^2 = R^2 \qquad (10\text{-}8)$$

Equation 10-8 represents the equation of a circle in the two dimensions. Here, the x-axis is σ'_x, the y-axis is τ', and R is the radius of the circle. The origin is located along the x-axis at a specified stress average ($x = \sigma_a$, $y = 0$). This Mohr circle provides the information that we