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Методические указания по чтению и переводу
для студентов 4 курса

Специальность 190631 «Техническое обслуживание и ремонт автомобильного транспорта»

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Методические указания разработаны на основе Федерального государственного образовательного стандарта (ФГОС) по специальности среднего профессионального образования 190631 «Техническое обслуживание и ремонт автомобильного транспорта» и адресованы студентам очной формы обучения.

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ПРЕДИСЛОВИЕ

Методические указания разработаны для студентов третьего курса средних профессиональных учебных заведений по специальности среднего профессионального образования 190631 «Техническое обслуживание и ремонт автомобильного транспорта» и предназначены для использования на практических занятиях по английскому языку.

Методические указания написаны на основе рабочей программы, которая соответствует Федеральному государственному образовательному стандарту.

В методических указаниях представлены теоретический материал изучаемого курса, задания для его практического применения, перечень тем для самостоятельной работы, которая развивает творческое мышление, умение пользоваться справочной литературой, помогает осмыслению изученного материала, стимулирует приобретение дополнительных специальных знаний и применение полученных знаний на практике.

Методические указания являются самостоятельным пособием для развития навыков чтения, извлечения и обработки информации.

Тексты и упражнения в работе распределены по темам, они информативны и профессионально ориентированы. Каждый текст предваряется заданиями, выполнение которых облегчает задачу его понимания и последующей работы с ним на послетекстовом этапе. В процессе работы над текстом усваивается лексика, что должно сформировать умение читать иноязычную статью по специальности с общим охватом содержания и, если необходимо, с точным пониманием всех его деталей при минимальном обращении к словарю.

Степень проработки того или иного текста определяется преподавателем в соответствии с целями и уровнем подготовленности группы.

В конце методических указаний помещен библиографический список.

PART 2
Unit Seven

Text: Gearbox

Dialogue

Предтекстовые упражнения
Exercises to be done before reading the text

Упражнение 1. Прочтите слова и словосочетания и запомните их русские эквиваленты

gearing — зубчатое соединение
road conditions — дорожные условия
forward speed — передняя скорость
reverse drive — обратный (задний) ход
low gear — первая передача
top gear — четвертая (прямая) передача
sliding-mesh gearbox — коробка передач со скользящими шестернями
shifting – переключение
in direct line-важно
constant-mesh gearbox— коробка передач с постоянным зацеплением шестерен
epicyclic (planetary) gearbox - эпициклическая (планетарная) коробка передач
ordinary gearing — стандартное зубчатое соединение
characteristic feature — характерная особенность
fixed axes — зафиксированные (неподвижные) оси
rotate bodyly — вращаться корпусом
axis — ось
axle — вал
secure — обеспечить

Упражнение 2. Прочтите и переведите на русский язык интернациональные слова.

Principal, function, construction, constructional, class, classify, type, planet, planetary, history, historical.

Упражнение 3*. Переведите слова, обращая внимание на суффиксы.
Move — move**ment**, construct — construct**ion** — construction**al**, arrange — arrange**ment**, history — historic**al** — historical**ly**, wide — wide**ly**, vary — vari**ous**, simple — simp**ly**, body — bodi**ly**.
*Прочтите текст, а затем выполните следующие за ним упражнения***.**

TEXT

Gearbox

The gearbox is placed between the clutch and the propeller shaft. I lie principal function of the gearbox is to vary the speed of the car movement to meet the road conditions. The gearbox provides four forward speeds and one reverse, as follows:

1. First or low gear;
2.Second gear;
3.Third gear;
4.Fourth or top gear;
5.Reverse gear.

There are many constructional arrangements of gearboxes, which can be classified as follows:

1.Sliding-mesh type;
2.Constant-mesh type;
3.Epicyclic (planetary) type.

The sliding-mesh type is the simplest one and is the oldest historically. The constant-mesh type is the most widely used type. They are termed "ordinary" gearing, the characteristic feature of which is that I lie axes of the various gears are fixed axes. The gears simply rotate about their own axes.

The characteristic feature of epicyclic (planetary) gearing is that one gear rotates about its own axis and also rotates bodily about some other axis.

To secure the several speeds of the car the clutch shaft is mounted In direct line with the gearbox shaft. The gearbox shaft carries on it the sliding gears which are used for shifting to secure the forward speeds and the reverse drive.

Послетекстовые упражнения
The exercises to be done after reading the text

Упражнение 4. Найдите в тексте ответы на вопросы.

1.Where is the gearbox situated?

2.What is the function of the gearbox?

3.What speeds does the gearbox provide?

4.What types of gearboxes do you know?

5.Why is the clutch shaft mouned in direct line with the gearbox shaft?

Упражнение 5. Подберите из правой колонки соответствующие окончания предложений из левой колонки.

1.The principal function of the gearbox is	a).sliding-mesh type, constant mesh type and planetary type
2.The gearbox provides	b). the simplest one and historically oldest
3.Gearbox can be	c).to vary the speed of the car
4.The sliding-mesh gearbox is one	d). four forward speeds and reverse
5.The constant-mesh gearbox is	e). the most widely used

Упражнение 6. Переведите предложения на английский язык.

1.Коробка передач предназначена для изменения скорости движения автомобиля.

2.Коробка передач обеспечивает четыре передние скорости и задний ход.

3.Коробки передач могут быть: со скользящими шестернями, с постоянным зацеплением шестерен и планетарного типа.

4.Самыми простыми являются коробки передач со скользящими шестернями.

5.Коробки передач с постоянным зацеплением шестерен используются наиболее часто.

6.Скользящие шестерни на валу коробки передач используются для обеспечения передних скоростей и обратного хода.

Упражнение 7. Переведите текст, пользуясь словарем**.**

Gearboxes are assembled and disassembled on special stands using special mechanisms. In case of trouble in change-speed gearbox it can be repaired only in the workshop. But in order not to get into trouble you should do the followings steps:

a).check the oil level in the gearbox casing;

b).wash the breather channel;

c).change the oil in accordance with the lubrication schedule;

d).wash the gearbox with a thin mineral oil;

e).drain the used oil through the drain hole.

Упражнение 8. Прочтите диалог и разыграйте его в парах.

DIALOGUE

Mike: Peter, do you remember what our teacher told us last time? What do you know about gearboxes?

Peter: I know that the gearbox is used to change the speed of the car.

M.: And how many speeds does the gearbox provide?

P.: It can provide four forward speeds and one reverse.

M.: Into what types are the gearboxes divided according to their arrangements?

P.: They are divided into sliding-mesh type, constant-mesh type and epicyclic type.

M.: What type is the simplest?

P.: The sliding-mesh one.

M.: Thank you very much for you help.

P.: You are welcome. Glad to help you

Unit Eight

Text: Brakes
Dialogue

Предтекстовые упражнения
Exercises to be done before reading the text

Упражнение 1**.** Прочтите слова и словосочетания и запомните их русские эквиваленты.

brakes — тормоза
force the fluid — подавать жидкость
performance — работа
under pressure — под давлением
safety — безопасность
brakes are applied — тормоза срабатывают
depend — зависет
slow — замедлять
braking effort — тормозное усилие
divide — разделять
push down on the brake pedal — нажать на тормозную педаль
namely — именно
drum brakes — барабанные тормоза
band brake — ленточный тормоз
disk brakes — дисковые тормоза
shoe brake — колодочный тормоз
hydraulic assisted brakes — тормоза с гидравлическим приводом
brake shoes — колодки тормоза
brake fluid — тормозная жидкость
brake pedal — тормозная педаль
master cylinder — главный цилиндр

Упражнение 2. Прочтите и переведите интернациональные слова.
Mechanism, passenger, type, hydraulic, cylinder, vacuum, function, classify, classification, mechanical, electric, electromagnet.

Упражнение 3*. Переведите слова, обращая внимание на суффиксы.
Safe — safe**ty**; to improve — improve**ment**; to move — move**ment**; to drive - driv**er**; to apply - applicat**ion**; to attach - attach**ment**; to arrange - arrange**ment**; to perform - perform**ance**; name - name**ly**; to operate — operat**ion**; to equip — equip**ment**.
Прочтите текст, а затем выполните следующие за ним упражнения.

TEXT

Brakes

Brakes are used to slow or stop the car where it is necessary. It is one of the most important mechanisms of the car as upon its proper

performance the safety of passengers depends. Car brakes can be divided into two types, namely: drum brakes and disc brakes. The drum type may be either a band brake or a shoe brake. Depending on their functions, the automobile has foot brakes and hand brakes (parking brakes). According to their mode of operation, the brakes are classified as: mechanical brakes, hydraulic brakes, airbrakes, electric brakes. Brakes are controlled by the brake pedal.

Most braking systems in use today are hydraulic. This system consists of a master cylinder mounted on the car frame and wheel cylinders. When the driver pushes down on the brake pedal, it forces the piston to move in the master cylinder and brake fluid is delivered from 11 to the wheel cylinders. The piston movement causes brake shoes to move and the brakes are applied (the brake shoes are pressed against the brake drums).

The air brake uses compressed air to apply the braking force to the brake shoes.

Electric brakes use electromagnets to provide the braking effort against the brake shoes.

Formerly brakes were applied only to the two rear wheels, but now all cars are equipped with all-wheels brakes. Today many improvements are being made in brakes.

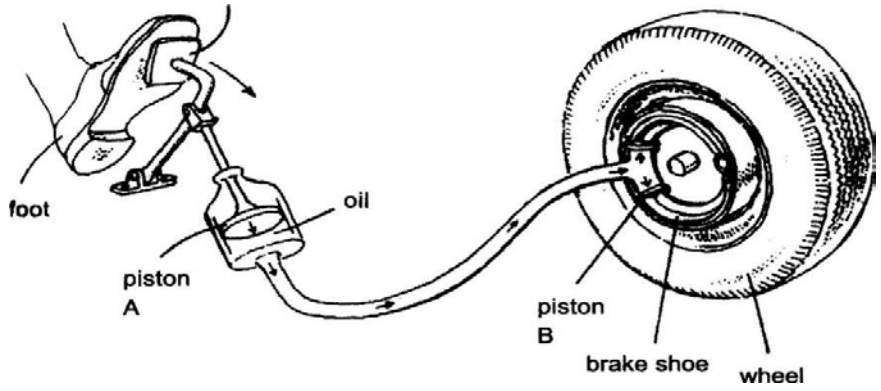


Рис. 3. Brake System

Послетекстовые упражнения
The exercises to be done after reading the text

Упражнение 4. Найдите в тексте английские эквиваленты следующих русских терминов и выпишите их.

Тормоза, безопасность пассажиров зависит от правильной работы тормозов, барабанные тормоза, дисковые тормоза, тормоза с усилителем, гидравлический привод тормозов, жидкость под давлением, тормоза срабатывают, тормозное усилие, нажать на тормозную педаль.

Упражнение 5. Найдите в тексте ответы на следующие вопросы:

1. What is the function of the brakes?
2. What types are brakes divided into?
3. What brakes do you know according to their mode of operation?
4. What braking systems are used today?
5. By what are brakes controlled?
6. When are brakes applied?

Упражнение 6. Выпишите из правой колонки русские слова и словосочетания, соответствующие английским из левой колонки.

1.performance	a. зависеть от
2.the safety of passengers	b. барабанные тормоза
3.to depend upon	c. тормоза срабатывают
4.namely	d. тормоза с гидравлическим приводом
5.drum brakes	
6.disc brakes	e. работа (действие)
7.brakes are applied	f. именно
8.hydraulic assisted brakes	g. тормоза с усилителем
9.power assisted brakes	h. под давлением
10.to press down on the brake pedal	i. нажать на тормозную пе даль
11.under pressure	j. дисковые тормоза
	k. безопасность пассажиров

Упражнение 7. Подберите из правой колонки соответствующее окончание для предложений из левой колонки.

1.Brakes are used for...	a. disc brakes and drum brakes
2.Brakes are one of ...	b. the driver pushes down on the pedal
3. Brakes may be of 2 types	c. the brake pedal
4. Brakes are applied by	d. stopping the car
5. Brakes are applied when	e. the most important mechanism of

Упражнение 8. Переведите следующие предложения на английский язык.

1.Тормоза являются наиболее важным механизмом автомобиля.

2.Они используются для замедления движения или остановки автомобиля.

3.Тормоза можно разделить на два типа, а именно: барабанные тормоза и дисковые тормоза.

4.На большинстве автомобилей используется гидравлический привод или пневматический привод.

5.Тормоза срабатывают, когда водитель нажимает на тормозную педаль.

Упражнение 9. Прочтите диалог, а затем выполните следующие за ним упражнения.

DIALOGUE

Alex: Why are brakes used?

Boris: They are used to stop or to slow the car.

A.: Well, it is one of the most important mechanisms of the car, isn't it?

B.:Of course, the safety of the passengers depends upon their proper performance.

A.:What types of brakes are used today?

B.:Drum brakes, disk brakes and others.

A.:And in what way are they applied?
B.:They are applied by the brake pedal. When the driver pushes down on the pedal they are applied.
A.:Thank you. It was very nice of you to tell me this information.
B.:Don't mention it. I was glad to serve you.

Упражнение 10. Расскажите на английском языке, о чем идет речь в диалоге

Упражнение 11. Найдите абзацы, в которых идет речь о сцеплении и о тормозах и запишите их в две колонки.

Two stories — in one

1. Brakes are the most important mechanism of the car. They are used to slow or stop the car where it is necessary.
2. The clutch is a friction device. It connects the engine to the wheels in the gearbox. It is used for freeing the engine from the gearbox, for starting the car and for releasing the engine from the car wheels.
3. It is fixed between the flywheel of the engine and the gearbox.
4. They are divided into 2 types, namely: drum brakes and disc brakes.
5. Most cars of today use hydraulic or power assisted brakes.
6. They may be of 2 plates: friction disc and pressure disc. The friction disc is situated between the flywheel and the pressure disc.

Упражнение 12. Переведите текст, пользуясь словарем.

Troubles in Braking System

The basic troubles of the braking system are as follows:
1. poor braking action;
2. sticking brake shoes which would not return to the initial position after a brake pedal is released;
3. non-uniform braking of the left and the right wheels on a common axle;
4. leakage of brake fluid and air leakage in the hydraulic brake;
5. poor air tightness of the pneumatic brake control.

What to do:

1. Check the action of the foot and hand brakes and leak proofness of the brake hoses connections, components of the hydraulic and pneumatic controls of the brakes, as well as of the vacuum- power system.
2. Inspect the friction linings, wheel-brake springs, master and wheel cylinders of the hydraulic brake and the air compressor of the pneumatic brake using a test manometer to check it.

Упражнение 13. Переведите предложения на английский язык.

1.Тормоза используются для замедления движения или остановки автомобиля.
2.В зависимости от привода тормоза классифицируют на механические, гидравлические, пневматические и электрические.
3.Тормоза управляются тормозной педалью.
4. Тормоза срабатывают, когда водитель нажимает на тормозную педаль (тормозные колодки прижимаются к тормозным барабанам).
5.В пневматических тормозах для создания тормозного усилия используется сжатый воздух.
6.В электрических тормозах для создания тормозного усилия используется электромагнит.
7.В современных автомобилях используются тормоза с приводом на все колеса

Unit Nine

Text: Steering System

Dialogue

Предтекстовые упражнения

The exercises to be done before reading the text

Упражнение 1. Прочтите слова и словосочетания и запомните их русские эквиваленты.

guide the car — управлять автомобилем
means of turning — средство поворота
front wheels — передние колеса
steering wheel — рулевое колесо
steering column — рулевая колонка
for this purpose — для этой цели
pivot — шарнир
swing (swang, swung) — поворачиваться
steering knuckle arm — рычаг поворотного кулака
tie-rod — поперечная тяга
in turn — в свою очередь
pitman arm — рулевая сошка
rack and pinion assembly — рулевой механизм с рейкой и шестерней
ball joint — шаровой шарнир
leverage — рычажный механизм
hose — шланг, рукав
steering gear assembly — рулевой механизм
rack and pinion type — реечно-шестеренчатый тип (рулевого механизма)
recirculating ball steering — рулевой механизм с шариковой гайкой
worm and sector — червяк и сектор
injury — повреждение
steering box — картер рулевого механизма

Упражнение 2. Прочтите слова и сопоставьте их с русскими значениями. column, spindle, system, hydraulic, pump, reservoir, popular, type, effective, effectiveness, effectively, energy, function, to deform, deformation.

Упражнение 3*. Переведите слова, обращая внимание на суффиксы и префиксы.

Rotate — rotat**ion**, apply — applicat**ion**, move — move**ment**, develop — develop**ment**, drive — driv**er**, form — **re**form — **de**form — deform**ation**, guide — guid**ance**.

*Прочтите текст, а затем выполните следующие за ним упражнения***.**

TEXT

Steering System

To guide the car, it is necessary to have some means of turning the front wheels so that the car can be pointed in the direction the driver wants to go. The steering wheel in front of the driver is linked by gears and levers to the front wheels for this purpose. The front wheels are on pivots so they can be swung to the left or right. They are attached by steering knuckle arms to the rods. The tie-rods are, in turn, attached (o (he pitman arm.

When the steering wheel is turned, gearing in the steering gear assembly causes the pitman arm to turn to the left or right. This movement is carried by the tie-rods to the steering knucle arms, and wheels, musing them to turn to the left or right.

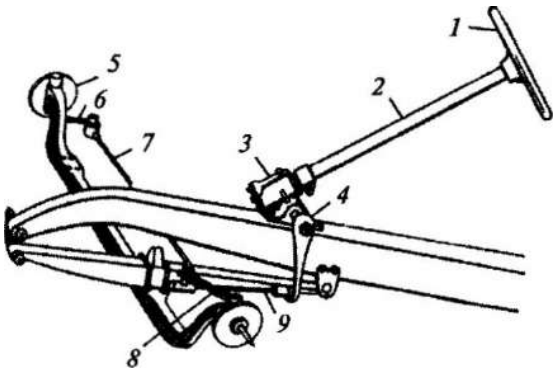


Рис. 4. Steering System

1.steering wheel - рулевое колесо

2.steering column, steering mast — рулевая колонка

3.sleering gear - рулевой механизм

4. sleering arm, steering lever, (steering) pitman arm — рулевая сошка

5.steering knuckle — поворотная цапфа, поворотный кулак

6. sleering knuckle lever, steering knuckle arm — рычаг поворотного кулака

7. single tie-rod - неразрезная поперечная рулевая тяга

8. steering knuckle lever, steering knuckle arm — рычаг поворотного кулака
9. drag link, steering gear connecting rod, steering drag rod — продольная рулевая тяга

The steering system incorporates: the steering wheel and column, steering gear, pitman arm, steering knuckle arm, front axle, steering knuckle pivot, tie-rods.

There are several different manual steering gears in current use, such as the rack and pinion type and the recirculating ball type. The

rack and pinion steering gear is widely used. Another manual steering gear which is popular in imported cars is the worm and sector type.

The steering wheel and column are the source of injury to the driver, air bags and other devices being developed now to safe the life of a driver.

Energy-absorbing columns must stop the steering wheel and column from being pushed to the rear as the front of the car is crushed in an impact.

Energy-absorbing columns must also provide the driver with a tolerable impact as he moves forward and strikes the wheel with his chest.

Послетекстовые упражнения
The exercises to be done after reading the text

Упражнение 4. Найдите в тексте ответы на вопросы.

1.What mechanism is necessary to guide the car?
2.How is the steering wheel connected to the front wheels?
3.Why can the front wheels be swung to the left or to the right?
4.What does the manual steering system incorporate?
5.What types of manual steering gears in use do you know?

Упражнение 5*. Переведите на русский язык, обращая особое внимание на герундий**.**

1.To guide the car it is necessary to have some means of turning the front wheels.
2.The steering wheel in front of the driver is linked by gears and levers to the front wheels for turning the car in the direction the driver wants to go.
3.Without using the steering system the car moves only in the direct position.

4.Manufacturers can use rack and pinion type steering gear without choosing another type because "rack and pinion" type steering is very dependable.
5.Energy-absorbing columns must stop the steering wheel from being pushed to the rear when the front of the car is damaged in an impact.

Упражнение 6. Переведите текст, не пользуясь словарем.
To turn the car you must have some means of turning the front wheels. For this purpose the steering wheel and steering column are linked to the front wheels. The front wheels are on pivots and can be swung to the left or to the right.
When the driver turns the steering wheel and column the front wheels (being on pivots) attached by the steering knuckle arms to the lie rods are also turned.

Упражнение 7. Переведите текст, пользуясь словарем.

Troubles of Steering Gear Components

Steering gear and linkage may have the following basic troubles: excessive steering-wheel free play, bending of steering rod, oil leakage from the steering-gear case, disadjustment of steering gear.

What to do

1.Check the steering-wheel free play and steering gear performance while the car is running.
2.Check the steering-gear case for oil leakage by visual inspection.
3.Adjust the steering gear. Steering gear of the worm and roller type is adjusted by end playing in the steering worm shaft bearings.

Упражнение 8. **Переведите предложения на английский язык.**
1.Для управления автомобилем необходима система рулевого управления.
2.Рулевое управление включает в себя: рулевое колесо и рулевую колонку, зубчатое соединение, рулевую сошку,
рычаги поворотного кулака и шарнирные соединения, рычаги и поперечные тяги.
3.Существуют различные типы рулевых механизмов, а именно: реечно-шестеренчатый тип, механизм с шаровой гайкой, механизм с червяком и сектором.

4.Когда водитель поворачивает руль влево или вправо, то рулевой механизм заставляет рулевую сошку поворачиваться влево или вправо. Это движение передается поперечными тягами к рычагам поворотных кулаков и к колесам, заставляя их поворачиваться влево или вправо.

Упражнение 9. Прочтите диалог, а затем выполните следующие за ним упражнения.

DIALOGUE

Stas: Look here. I have some troubles with the steering system.
Vlad: What troubles?
S.: The first is excessive free play of the steering wheel.
V.: You should check free play of the steering wheel and steering gear performance.
S.: The second problem is oil leakage from the steering gear case.
V.: Check the steering gear case for oil leakage visually. Anything else?
S.: Sure. It is disadjustment of the steering gear. And I don't know what to do.
V.: You see, in this case it is better for you to go to a repairing shop. Good specialists should do this job.
S.: Thank you very much.
V.: Not at all.
Notes:
look here — послушай;
troubles — неисправности, неполадки;
excessive free play — чрезмерный свободный ход;
check — проверять;
performance — работа, характеристики;
steering gear case — картер коробки передач,
anything else — что еще
in this case — в этом случае.

Упражнение 10. Разыграйте диалог в паре.

Unit Ten

Text: Using Computer

Dialogue

Предтекстовые упражнения

The exercises to be done before reading the text

Упражнение 1. Прочтите слова и словосочетания и запомните их русские эквиваленты.

invent — изобретать

a breaker point ignition — прерывистое зажигание

advanced — усовершенствованный

fire the spark plug — воспламенять свечой зажигания

meet emission control levels — отвечать требованиям по ограничению уровня вредных компонентов в выхлопных газах

gas mileage - пробег в милях на галлон топлива

smooth operation — плавная работа

provide — обеспечить

onboard computer system — бортовой компьютер

hardware — аппаратная часть компьютера

software — программное обеспечение

CPU — Central Processing Unit - центральный процессор

integrated circuit — интегральная схема

semiconductor — полупроводник

silicon — кремний

until — пока не

specific sequence — специальная последовательность

permanent memory — постоянная память

ROM — read only memory — постоянная память, постоянное запоминающее устройство, ПЗУ

RAM — random access memory - оперативная память, оперативное запоминающее устройство, ОЗУ

PROM — programmable read only memory - программируемое постоянное запоминающее устройство, ППЗУ

trouble code — неисправный код

expensive — дорогостоящий

adaptive memory — адаптивная память

Упражнение 2. Прочтите слова и сопоставьте их с русскими значениями.
transform, battery, voltage, regulation, system, computer, microprocessor, transistor, diod, chip, material, electricity, magnetic, program, defective, limit, compensate, variation, code.

Упражнение 3*. Переведите слова, обращая внимание на суффиксы и префиксы.

ignite — ignit**ion**, transform — transform**ation**, regulate — regula- t**ion**, break — break**er**, conduct — conduct**or**, process — process**or**, specify - specif**ic**, adapt — adapt**er** — adapt**ive**, expense -expens**ive**, adjust — adjust**ment**, connect — **dis**connect, learn - **re**learn.

*Прочтите и переведите текст, а затем выполните следующие за ним упражнения***.**

TEXT

Using Computer

Ever since the car was first invented, a breaker point ignition has been used to transform battery voltage into 20,000 volts to fire the spark plugs. With government intervention and regulation, more advanced system was needed. This system had to meet emission control levels, gas mileage, and provide a smooth and continuous operation. The answer was found in an on-board computer system. The computer mounted on modern cars has two components. One is the hardware and the other is the software.

The computer hardware on an automobile uses a Central Processing Unit (CPU), which, when made in an integrated circuit, is referred I o as a microprocessor. The integrated circuit (IC) combines transistors, diodes, and capacitors, which are placed on a tiny chip of semiconductor material that is smaller and thinner that an eraser on a pencil. The material used most of the time is silicon. Silicon, like any **semiconductor,** does not conduct electricity until either voltage, a magnetic field, heat, or light is directed to the semiconductor. A program instructs the microprocessor what to do.

The computer software on a car carries a program. The program (ells the computer what to do, and when to do it in a specific sequence. The program is stored in a permanent memory, which is referred to as Read Only Memory (ROM).The computer knows only what is placed in its memory.

There is another variation, which is called the Programmable Read Only Memory (PROM), which can be readily removed und replaced, while the ROM cannot. This makes it less expensive if the memory becomes defective. Only the PROM has to be replaced, not the entire microprocessor. The microprocessor contains a ROM (or PROM) and a RAM. RAM stands for Randon Access Memory, which can be accessed without going through a specific sequence. The technician interfaces with the RAM whenever trouble codes are accessed. Not all computerized ignition systems have trouble codes, however. Some computers have the ability to learn. This is referred to as an adaptive memory. When a value falls outside of a specified limit, due to engine wear, the adaptive memory makes a slight adjustment in the program to compensate. The car must be driven from 20 to 30 miles, as it takes the computer this long to learn. Any time that power is disconnected from the computer, it will have to relearn everything.

Послетекстовые упражнения
The exercises to be done after reading the text

Упражнение 4. Найдите в тексте ответы на вопросы.

1.How many components has the computer on modern cars? What are they?
2.How do we call the computer hardware on the automobile?
3.What does an integrated circuit combine?
4.What material is used in the integrated circuit? Why?
5.What does the computer software do?
6.Why is the computer used on board the car?
7.What does the program tell to the computer?
8.Where is the program stored?
9.What is ROM?
10.What is PROM?
11.What is RAM?

Упражнение 5. Переведите на английский язык.

1.Многие современные автомобили оборудованы бортовыми компьютерными системами для лучшей работы автомобиля.

2.Программа такого компьютера имеет только два запоминающих устройства: постоянную память (ПЗУ) и оперативную память (ОЗУ).
3.Компьютерная программа сообщает компьютеру, что надо делать и когда необходимо выполнить данное действие в соответствующей последовательности.
4.Программа хранится в постоянной памяти компьютера.
5.Микропроцессор содержит в себе постоянную и оперативную память.
6. Некоторые компьютеры обладают способностью запоминать (заучивать). Это относится к адаптивной памяти.

Упражнение 6. Прочтите диалог, а затем выполните следующие за ним упражнения**.**

DIALOGUE

Anton: What is the purpose of using computers on board the car?
Vlad: You see. As I know computer is used to advance the engine operation as well as the performance of other units.
A.: What components does the on-board computer consist of?
V.: It consists of two components. One is the hardware and the other is the software.
A.: What is hardware?
V.: The computer hardware uses a Central Processing Unit (CPU) which is referred to as a microprocessor.
A.: What is software?
V.: The computer software on a car carries a program. The program tells the computer what to do and when to do it.
A.: And where is the program stored?
V.: It is stored in a permanent memory which is called Read Only Memory (ROM).
A.: And what is Programmable Read Only Memory (PROM)? What is the difference between ROM and PROM?
V.: In case the memory becomes defective PROM can be readily removed and replaced, while ROM cannot.
A.: And what is RAM?

V.: RAM is Random Access Memory (main memory), which can be accessed without going through a specific sequence. The technician interfaces with RAM whenever trouble codes are accessed.
A.: Thanks a lot for your explanation.
V.: You are welcome. See you later.
A.: Goodbye.

Упражнение 7. Разыграйте диалог в паре.

Supplementary Reading

Read the texts following the instructions of a teacher:

Text 1 **Internal Combustion**

The principle behind any reciprocating internal combustion engine: If you put a tiny amount of high-energy fuel (like gasoline) in a small, enclosed space and ignite it, an incredible amount of energy is released in the form of expanding gas. You can use that energy to propel a potato 500 feet. In this case, the energy is translated into potato motion. You can also use it for more interesting purposes. For example, if you can create a cycle that allows you to set off explosions like this hundreds of times per minute, and if you can harness that energy in a useful way, what you have is the core of a car engine!

Almost all cars currently use what is called a **four-stroke combustion cycle** to convert gasoline into motion. The four-stroke approach is also known as the **Otto cycle**, in honor of Nikolaus Otto, who invented it in 1867. The four strokes are illustrated in **Figure 1**. They are:

- Intake stroke
- Compression stroke
- Combustion stroke
- Exhaust stroke

Figure 1

You can see in the figure that a device called a **piston** replaces the potato in the potato cannon. The piston is connected to the **crankshaft** by a **connecting rod**. As the crankshaft revolves, it has the effect of "resetting the cannon." Here's what happens as the engine goes through its cycle:

1. The piston starts at the top, the intake valve opens, and the piston moves down to let the engine take in a cylinder-full of air and gasoline. This is the **intake stroke**. Only the tiniest drop of gasoline needs to be mixed into the air for this to work. (Part 1 of the figure)

2. Then the piston moves back up to compress this fuel/air mixture. **Compression** makes the explosion more powerful. (Part 2 of the figure)

3. When the piston reaches the top of its stroke, the spark plug emits a spark to ignite the gasoline. The gasoline charge in the cylinder **explodes**, driving the piston down. (Part 3 of the figure)

4. Once the piston hits the bottom of its stroke, the exhaust valve opens and the **exhaust** leaves the cylinder to go out the tailpipe. (Part 4 of the figure)

Now the engine is ready for the next cycle, so it intakes another charge of air and gas.

Notice that the motion that comes out of an internal combustion engine is **rotational**, while the motion produced by a potato cannon is **linear** (straight line). In an engine the linear motion of the pistons is converted into rotational motion by the crankshaft. The rotational motion is nice because we plan to turn (rotate) the car's wheels with it anyway.

Text 2 Basic Engine Parts

The core of the engine is the cylinder, with the piston moving up and down inside the cylinder. The engine described above has one cylinder. That is typical of most lawn mowers, but most cars have more than one cylinder (four, six and eight cylinders are common). In a multi-cylinder engine, the cylinders usually are arranged in one of three ways: **inline**, **V** or **flat** (also known as horizontally opposed or boxer), as shown in the following figures.

Different configurations have different advantages and disadvantages in terms of smoothness, manufacturing cost and shape characteristics. These advantages and disadvantages make them more suitable for certain vehicles.

Let's look at some key engine parts in more detail.

Spark plug

The spark plug supplies the spark that ignites the air/fuel mixture so that combustion can occur. The spark must happen at just the right moment for things to work properly.

Valves

The intake and exhaust valves open at the proper time to let in air and fuel and to let out exhaust. Note that both valves are closed during compression and combustion so that the combustion chamber is sealed.

Piston

A piston is a cylindrical piece of metal that moves up and down inside the cylinder.

Piston rings

Piston rings provide a sliding seal between the outer edge of the piston and the inner edge of the cylinder. The rings serve two purposes:

- They prevent the fuel/air mixture and exhaust in the combustion chamber from leaking into the sump during compression and combustion.
- They keep oil in the sump from leaking into the combustion area, where it would be burned and lost.

Most cars that "burn oil" and have to have a quart added every 1,000 miles are burning it because the engine is old and the rings no longer seal things properly.

Connecting rod

The connecting rod connects the piston to the crankshaft. It can rotate at both ends so that its angle can change as the piston moves and the crankshaft rotates.

Crankshaft

The crankshaft turns the piston's up and down motion into circular motion just like a crank on a jack-in-the-box does.

Sump

The sump surrounds the crankshaft. It contains some amount of oil, which collects in the bottom of the sump (the oil pan).

Next, we'll learn what can go wrong with engines.

Text 3 Engine Problems

So you go out one morning and your engine will turn over but it won't start... What could be wrong? Now that you know how an engine works, you can understand the basic things that can keep an engine from running. Three fundamental things can happen: a bad fuel mix, lack of compression or lack of spark. Beyond that, thousands of minor things can create problems, but these are the "big three." Based on the simple engine we have been discussing, here is a quick rundown on how these problems affect your engine:

Bad fuel mix - A bad fuel mix can occur in several ways:

- You are out of gas, so the engine is getting air but no fuel.
- The air intake might be clogged, so there is fuel but not enough air.
- The fuel system might be supplying too much or too little fuel to the mix, meaning that combustion does not occur properly.
- There might be an impurity in the fuel (like water in your gas tank) that makes the fuel not burn.

Lack of compression - If the charge of air and fuel cannot be compressed properly, the combustion process will not work like it should. Lack of compression might occur for these reasons:

- Your piston rings are worn (allowing air/fuel to leak past the piston during compression).
- The intake or exhaust valves are not sealing properly, again allowing a leak during compression.
- There is a hole in the cylinder.

The most common "hole" in a cylinder occurs where the top of the cylinder (holding the valves and spark plug and also known as **the cylinder head**) attaches to the cylinder itself. Generally, the cylinder and the cylinder head bolt together with a thin **gasket** pressed between them to ensure a good seal. If the gasket breaks down, small holes develop between the cylinder and the cylinder head, and these holes cause leaks.

Lack of spark - The spark might be nonexistent or weak for a number of reasons:

- If your spark plug or the wire leading to it is worn out, the spark will be weak.
- If the wire is cut or missing, or if the system that sends a spark down the wire is not working properly, there will be no spark.

- If the spark occurs either too early or too late in the cycle (i.e. if the **ignition timing** is off), the fuel will not ignite at the right time, and this can cause all sorts of problems.

Many other things can go wrong. For example:

- If the battery is dead, you cannot turn over the engine to start it.
- If the bearings that allow the crankshaft to turn freely are worn out, the crankshaft cannot turn so the engine cannot run.
- If the valves do not open and close at the right time or at all, air cannot get in and exhaust cannot get out, so the engine cannot run.
- If someone sticks a potato up your tailpipe, exhaust cannot exit the cylinder so the engine will not run.
- If you run out of oil, the piston cannot move up and down freely in the cylinder, and the engine will seize.

In a properly running engine, all of these factors are within tolerance.

As you can see, an engine has a number of systems that help it do its job of converting fuel into motion. We'll look at the different subsystems used in engines in the next few sections.

Text 4 Engine Valve Train and Ignition Systems

Most engine subsystems can be implemented using different technologies, and better technologies can improve the performance of the engine. Let's look at all of the different subsystems used in modern engines, beginning with the valve train.

The valve train consists of the valves and a mechanism that opens and closes them. The opening and closing system is called a **camshaft**. The camshaft has lobes on it that move the valves up and down, as shown in **Figure 5**.

Most modern engines have what are called **overhead cams**. This means that the camshaft is located above the valves, as you see in Figure 5. The cams on the shaft activate the valves directly or through a very short linkage. Older engines used a camshaft located in the sump near the crankshaft. **Rods** linked the cam below to **valve lifters** above the valves. This approach has more moving parts and also causes more lag between the cam's activation of the valve and the valve's subsequent motion. A **timing belt** or timing chain links

the crankshaft to the camshaft so that the valves are in sync with the pistons. The camshaft is geared to turn at one-half the rate of the crankshaft. Many high-performance engines have four valves per cylinder (two for intake, two for exhaust), and this arrangement requires two camshafts per bank of cylinders, hence the phrase "dual overhead cams." See How Camshafts Work for details.

Figure 6. The ignition system

The **ignition system** (Figure 6) produces a high-voltage electrical charge and transmits it to the spark plugs via **ignition wires**. The charge first flows to a **distributor**, which you can easily find under the hood of most cars. The distributor has one wire going in the center and four, six, or eight wires (depending on the number of cylinders) coming out of it. These **ignition wires** send the charge to each spark plug. The engine is timed so that only one cylinder receives a spark from the distributor at a time. This approach provides maximum smoothness. See How Automobile Ignition Systems Work for more details.

We'll look at how your car's engine starts, cools and circulates air in the next section.

Text 5 Engine Cooling, Air-intake and Starting Systems

The **cooling system** in most cars consists of the radiator and water pump. Water circulates through passages around the cylinders and then travels through the radiator to cool it off. In a few cars (most notably Volkswagen Beetles), as well as most motorcycles and lawn mowers, the engine is air-cooled instead (You can tell an air-cooled engine by the fins adorning the outside of each cylinder to help dissipate heat.). Air-cooling makes the engine lighter but hotter, generally decreasing engine life and overall performance. See How Car Cooling Systems Work for details.

So now you know how and why your engine stays cool. But why is air circulation so important? Most cars are **normally aspirated**, which means that

air flows through an air filter and directly into the cylinders. High-performance engines are either **turbocharged** or **supercharged**, which means that air coming into the engine is first pressurized (so that more air/fuel mixture can be squeezed into each cylinder) to increase performance. The amount of pressurization is called **boost**. A turbocharger uses a small turbine attached to the exhaust pipe to spin a compressing turbine in the incoming air stream. A supercharger is attached directly to the engine to spin the compressor.

See How Turbochargers Work for details.

Increasing your engine's performance is great, but what exactly happens when you turn the key to start it? The **starting system** consists of an electric starter motor and a **starter solenoid**. When you turn the ignition key, the starter motor spins the engine a few revolutions so that the combustion process can start. It takes a powerful motor to spin a cold engine. The starter motor must overcome:

- All of the internal friction caused by the piston rings
- The compression pressure of any cylinder(s) that happens to be in the compression stroke
- The energy needed to open and close valves with the camshaft
- All of the "other" things directly attached to the engine, like the water pump, oil pump, alternator, etc.

Because so much energy is needed and because a car uses a 12-volt electrical system, hundreds of amps of electricity must flow into the starter motor. The starter solenoid is essentially a large electronic switch that can handle that much current. When you turn the ignition key, it activates the solenoid to power the motor.

Text 6 Engine Lubrication, Fuel, Exhaust and Electrical Systems

When it comes to day-to-day car maintenance, your first concern is probably the amount of gas in your car. How does the gas that you put in power the cylinders? The engine's fuel system pumps gas from the gas tank and mixes it with air so that the proper air/fuel mixture can flow into the cylinders. Fuel is delivered in three common ways: carburetion, port fuel injection and direct fuel injection.

- In carburetion, a device called a carburetor mixes gas into air as the air flows into the engine.
- In a fuel-injected engine, the right amount of fuel is injected individually into each cylinder either right above the intake valve (port fuel injection) or directly into the cylinder (direct fuel injection).

Oil also plays an important part. The lubrication system makes sure that every moving part in the engine gets oil so that it can move easily. The two main parts needing oil are the pistons (so they can slide easily in their cylinders) and any bearings that allow things like the crankshaft and camshafts to rotate freely. In most cars, oil is sucked out of the oil pan by the oil pump, run through the oil filter to remove any grit, and then squirted under high pressure onto bearings and the cylinder walls. The oil then trickles down into the sump, where it is collected again and the cycle repeats.

Now that you know about some of the stuff that you put *in* your car, let's look at some of the stuff that comes out of it. The exhaust system includes the exhaust pipe and the muffler. Without a muffler, what you would hear is the sound of thousands of small explosions coming out your tailpipe. A muffler dampens the sound. The exhaust system also includes a catalytic converter. See How Catalytic Converters Work for details.

The emission control system in modern cars consists of a catalytic converter, a collection of sensors and actuators, and a computer to monitor and adjust everything. For example, the catalytic converter uses a catalyst and oxygen to burn off any unused fuel and certain other chemicals in the exhaust. An oxygen sensor in the exhaust stream makes sure there is enough oxygen available for the catalyst to work and adjusts things if necessary.Besides gas, what else powers your car? The electrical system consists of a battery and an alternator. The alternator is connected to the engine by a belt and generates electricity to recharge the battery. The battery makes 12-volt power available to everything in the car needing electricity (the ignition system, radio, headlights, windshield wipers, power windows and seats, computers, etc.) through the vehicle's wiring.

Text 7 Engine Questions and Answers

Here is a set of engine-related questions from readers and their answers:

- **What is the difference between a gasoline engine and a diesel engine?** In a diesel engine, there is no spark plug. Instead, diesel fuel is injected into the cylinder, and the heat and pressure of the compression stroke cause the fuel to ignite. Diesel fuel has a higher energy density than gasoline, so a diesel engine gets better mileage. See How Diesel Engines Work for more information.

- **What is the difference between a two-stroke and a four-stroke engine?** Most chain saws and boat motors use two-stroke engines. A two-stroke engine has no moving valves, and the spark plug fires each time the piston hits the top of its cycle. A hole in the lower part of the cylinder wall lets in gas and air. As the piston moves up it is compressed, the spark plug ignites combustion, and exhaust exits through another hole in the cylinder. You have to mix oil into the gas in a two-stroke engine because the holes in the cylinder wall prevent the use of rings to seal the combustion chamber. Generally, a two-stroke engine produces a lot of power for its size because there are twice as many combustion cycles occurring per rotation. However, a two-stroke engine uses more gasoline and burns lots of oil, so it is far more polluting. See How Two-stroke Engines Work for more information.

- **You mentioned steam engines in this article -- are there any advantages to steam engines and other external combustion engines?** The main advantage of a steam engine is that you can use anything that burns as the fuel. For example, a steam engine can use coal, newspaper or wood for the fuel, while an internal combustion engine needs pure, high-quality liquid or gaseous fuel. See How Steam Engines Work for more information.

- **Are there any other cycles besides the Otto cycle used in car engines?** The two-stroke engine cycle is different, as is the diesel cycle described above. The engine in the Mazda Millenia uses a modification of the Otto cycle called the Miller cycle. Gas turbine engines use the Brayton cycle. Wankel rotary engines use the Otto cycle, but they do it in a very different way than four-stroke piston engines.

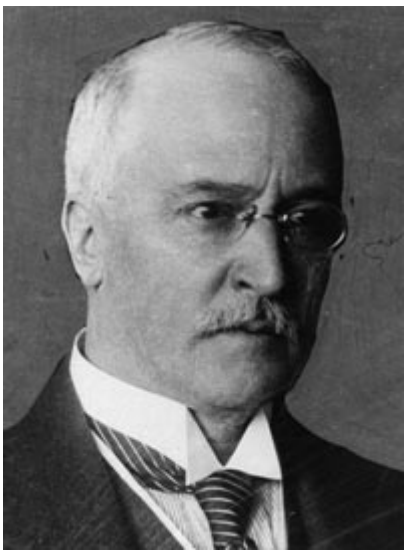
- **Why have eight cylinders in an engine? Why not have one big cylinder of the same displacement of the eight cylinders instead?** There are

a couple of reasons why a big 4.0-liter engine has eight half-liter cylinders rather than one big 4-liter cylinder. The main reason is smoothness. A V-8 engine is much smoother because it has eight evenly spaced explosions instead of one big explosion. Another reason is starting torque. When you start a V-8 engine, you are only driving two cylinders (1 liter) through their compression strokes, but with one big cylinder you would have to compress 4 liters instead

Text 8 Diesel Engines

One of the most popular HowStuffWorks articles is How Car Engines Work, which explains the basic principles behind internal combustion, discusses the four-stroke cycle and talks about all of the subsystems that help your car's engine to do its job. For a long time after we published that article, one of the most common questions asked (and one of the most frequent suggestions made in the suggestion box) was, "What is the difference between a gasoline and a diesel engine?"

Diesel's story actually begins with the invention of the **gasoline engine**. Nikolaus August Otto had invented and patented the gasoline engine by 1876. This invention used the four-stroke combustion principle, also known as the "Otto Cycle," and it's the basic premise for most car engines today. In its early stage, the gasoline engine wasn't very efficient, and other major methods of transportation such as the **steam engine** fared poorly as well. Only about 10 percent of the fuel used in these types of engines actually moved a vehicle. The rest of the fuel simply produced useless heat.



Rudolf Diesel, inventor of the diesel engine.

Hulton Archive/Getty Images

In 1878, Rudolf Diesel was attending the Polytechnic High School of Germany (the equivalent of an engineering college) when he learned about the low efficiency of gasoline and steam engines. This disturbing information inspired him to create an engine with a **higher efficiency**, and he devoted much of his time to developing a "Combustion Power Engine." By 1892 Diesel had obtained a patent for what we now call the diesel engine.

If diesel engines are so efficient, why don't we use them more often? You might see the words "diesel engine" and think of big, hefty cargo trucks spewing out black, sooty smoke and creating a loud clattering noise. This negative image of diesel trucks and engines has made diesel less attractive to casual drivers in the United States -- although diesel is great for hauling large shipments over long distances, it hasn't been the best choice for everyday commuters. This is starting to change, however, as people are improving the diesel engine to make it cleaner and less noisy.

If you haven't already done so, you'll probably want to read How Car Engines Work first, to get a feel for the basics of internal combustion. But hurry back -- in this article, we unlock the secrets of the diesel engine and learn about some new advancements.

Text 9 Diesel Engines vs. Gasoline Engines

In theory, diesel engines and gasoline engines are quite similar. They are both **internal combustion engines** designed to convert the chemical energy available in fuel into mechanical energy. This mechanical energy moves pistons up and down inside cylinders. The pistons are connected to a crankshaft, and the up-and-down motion of the pistons, known as linear motion, creates the rotary motion needed to turn the wheels of a car forward.Both diesel engines and gasoline engines covert fuel into energy through a series of small explosions or combustions. The major difference between diesel and gasoline is the way these explosions happen. In a gasoline engine, fuel is mixed with air, compressed by pistons and ignited by sparks from spark plugs. In a diesel engine, however, the air is compressed first, and then the fuel is injected. Because air heats up when it's compressed, the fuel ignites.

The following animation shows the diesel cycle in action. You can compare it to the animation of the gasoline engine to see the differences.

The diesel engine uses a four-stroke combustion cycle just like a gasoline engine. The four strokes are:

- **Intake stroke** -- The intake valve opens up, letting in air and moving the piston down.
- **Compression stroke** -- The piston moves back up and compresses the air.
- **Combustion stroke** -- As the piston reaches the top, fuel is injected at just the right moment and ignited, forcing the piston back down.
- **Exhaust stroke** -- The piston moves back to the top, pushing out the exhaust created from the combustion out of the exhaust valve.

Remember that the diesel engine has no spark plug, that it intakes air and compresses it, and that it then injects the fuel directly into the combustion chamber (direct injection). It is the heat of the compressed air that lights the fuel in a diesel engine. In the next section, we'll examine the diesel injection process.

Compression

When working on his calculations, Rudolf Diesel theorized that higher compression leads to higher efficiency and more power. This happens because when the piston squeezes air with the cylinder, the air becomes concentrated. Diesel fuel has a high energy content, so the likelihood of diesel reacting with the concentrated air is greater. Another way to think of it is when air molecules are packed so close together, fuel has a better chance of reacting with as many oxygen molecules as possible. Rudolf turned out to be right -- a gasoline engine compresses at a ratio of 8:1 to 12:1, while a diesel engine compresses at a ratio of 14:1.

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