

МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РОССИЙСКОЙ ФЕДЕРАЦИИ

Курганский государственный университет

Кафедра иностранных языков технических специальностей

АНГЛИЙСКИЙ ЯЗЫК

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LESSON 1

Active Vocabulary

- | | |
|-----------------|----------------------------------|
| 1. to develop | – развивать |
| 2. adequate | – соответствующий |
| 3. vehicle | – повозка, перевозочное средство |
| 4. inventor | – изобретатель |
| 5. to design | – конструировать |
| 6. tracklaying | – гусеничный |
| 7. steam engine | – паровой двигатель |
| 8. up-to-date | – современный |
| 9. to withstand | – выдерживать, противостоять |
| 10. load | – нагрузка |
| 11. speed | – скорость |
| 12. body | – кузов |
| 13. to insulate | – изолировать |
| 14. upholstery | – внутренняя обшивка |
| 15. to equip | – оборудовать, снабжать |
| 16. to operate | – работать |
| 17. device | – устройство, приспособление |
| 18. virgin soil | – целинные земли |
| 19. highway | – шоссе |
| 20. to maintain | – ремонтировать |
| 21. space | – пространство |

1. Choose the equivalents to the following terms:

- | | |
|-----------------|-----------------------|
| 1) tracklaying | а) конструкция |
| 2) installation | б) гусеничный |
| 3) device | в) внутренняя обшивка |
| 4) upholstery | г) устройство |
| 5) design | д) установка |

2. Choose the correct equivalents to the parts of sentences:

1. Tractor put in motion by a steam engine
 - а) машина, приводимая в движение паровым двигателем
 - б) машина, приводимая в движение дизель-двигателем
 - с) трактор, приводимый в движение паровым двигателем
2. Vehicle able to withstand heavy loads
 - а) машины, способные вынести большие скорости
 - б) повозки, способные противостоять тяжелым нагрузкам
 - с) тракторы, способные выдержать тяжелые нагрузки
3. Machines for maintaining highway
 - а) тракторы для ремонта дорог
 - б) тракторы для работы в садах
 - с) машины для обслуживания автомобильных дорог

Grammar: 1. to be, to have, there to be (Recapitulation)
2. Present, Past, Future Indefinite Passive Voice

Models: 1. A car is put in motion by an engine.
2. The first car was constructed by Blinov.
3. Many new cars will be constructed in our country.

Machine-Building Industry

The motor car as we know it has developed from its early beginnings in the 1870s when it began to replace the horse drawn carriage which was the main mean of land transport in those days. The modern car has many similarities to the old "horseless carriages" of Daimler, Benz, Panhard and the numerous other inventors of that age, but engineers now know much more about how and why things work and can use their knowledge to design cars that are more efficient and more comfortable. They also have better materials to use which are lighter and stronger and computers to help them to make the best use of these advantages. In addition modern machinery enables these complicated vehicles to be made in large numbers economically.

The present day car is a complex piece of machinery involving advanced technology.

In our country the automobile and tractor industries were developed after the October Revolution in 1917. Pre-revolutionary Russia had no automobile and tractor industries at all. The first vehicle was constructed by a Russian inventor Shamshurankov. The vehicle was put in motion by pedals. Blinov designed and constructed a tracklaying tractor. This tractor was driven by a steam engine. Up-to-date our automobiles and tractors are able to withstand heavy loads and high speeds for long periods of operation. The modern automobile possesses a steel body and a steel roof over the car, this roof is insulated against the summer's heat and winter's cold. Upholstery is designed for comfort and insulation. Automobiles are equipped with ventilation installations. There is an adequate space to carry the luggage. Up-to-date automobiles have radio, light, heater and other electrically operated devices.

Tractors are widely used in agriculture as well as in industry all over the country. The use of tractors made possible the cultivation of vast areas of virgin soils.

Special types and models were also developed for maintaining highways and for work in orchards and groves.

1. Put the following sentences into the Active Voice according to the example:
The house was constructed by workers.
Workers constructed the house.

1. The first vehicle was built by a Russian inventor. 2. The tracklaying tractor was designed and constructed by Blinov. 3. Tractors were driven by

steam engines. 4. Internal combustion engine (двигатель внутреннего сгорания) was designed by Namin.

2. Answer the following questions.

1. When were first motor cars developed?
2. What inventors of that age do you know?
3. When were the automobile and tractor industries developed in our country?
4. Had pre-revolutionary Russia automobile and tractor industries?
5. Who built the first vehicle?
6. By what means was the first vehicle put into motion?
7. Who designed a tracklaying tractor?
8. What was this tractor driven by?
9. What is upholstery designed for?
10. What are automobiles equipped with?
11. What devices have up-to-date automobiles?
12. Where are tractors used?

3. Topics for oral work: 1) Speak about the first vehicle.

2) Speak about up-to-date automobiles.

LESSON 2

- | | |
|-----------------------|------------------------------|
| 1. power plant | – силовая установка |
| 2. chassis | – шасси |
| 3. wheel | – колесо |
| 4. to rotate | – вращать |
| 5. to include | – включать в себя |
| 6. fuel system | – топливная система |
| 7. lubricating system | – система смазки |
| 8. power train | – система передачи мощности |
| 9. frame | – рама |
| 10. axle | – ось |
| 11. spring | – рессора |
| 12. power brake | – механический тормоз |
| 13. clutch | – сцепление, муфта сцепления |
| 14. propeller shaft | – карданный вал |
| 15. rear axle | – задний мост |
| 16. final drive | – главная передача |
| 17. hood | – чехол, кожух, капот |
| 18. fender | – крыло |
| 19. accessories | – второстепенные части |
| 20. lever | – рычаг, рукоятка |
| 21. pivot | – шарнир, стержень |
| 22. gear box | – коробка передач |

1. Choose the Russian equivalents to the following terms:

- | | |
|--------------------|-------------------------|
| 1) power plant | a) карданный вал |
| 2) brake system | b) силовая установка |
| 3) propeller shaft | c) руль |
| 4) steering wheel | d) второстепенные части |
| 5) accessories | e) тормозная система |

2. Choose the Russian equivalents to the following sentences:

1. The power plant includes fuel system.
 - a) Двигатель вращает колеса.
 - b) Силовая установка включает в себя тормозную систему.
 - c) Силовая установка включает в себя топливную систему.
2. The chassis includes the brake system.
 - a) Рама включает в себя систему управления.
 - b) Шасси состоит из трансмиссии.
 - c) Шасси включает в себя тормозную систему.
3. The power train carries the power to the wheels.
 - a) Трансмиссия передает энергию от двигателя.
 - b) Трансмиссия включает в себя муфту сцепления.
 - c) Система передачи мощности передает энергию колесам.

Grammar: Present, Past, Future Indefinite Active and Passive Voices (Recapitulation)

COMPONENTS OF THE AUTOMOBILE Part 1

The automobile consists of three basic parts: the power plant, the chassis and the body.

The power plant or engine is the source of power that makes the car wheels and the car move. It includes the electric, fuel, cooling and lubricating systems.

The chassis consists of a power train and a frame with axles, wheels and spring. The chassis includes the brake system and the steering system as well.

The power train carries the power from the engine to the car wheels. It consists of the clutch, gear box, propeller shaft, rear axle, final drive, etc.

The body has a hood, fenders and accessories: the heater, lights, radio and so on.

The body is designed to contain and protect not only the engine and other car components but it provides protection to the occupants from wind, dust, cold and rain as well.

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 required. The steering wheel in front of the driver is connected by gears and levers to the front wheels for the purpose. The front wheels are on pivots so they can be swung to the left or right.

Brakes are necessary to slow or stop the car. They are considered to be the most important mechanisms on the car. Upon their proper work the safety and lives of people riding in the car depend.

Most braking systems are hydraulic. But many vehicles now use power brakes.

3. Choose the definition of the following terms:

- | | |
|--------------------|---|
| 1. The body | a) are mechanisms which slow or stop the car. |
| 2. The engine | b) is the mechanism which carries the power from the engine to the car wheels. |
| 3. Brakes | c) is the part of the machine which protects the car components and passengers. |
| 4. The power train | d) is the source of power that moves the car. |

4. Put the verbs in brackets into the Present, Past and Future Indefinite Passive.

Example: Heat (to transform) into work. – Heat is transformed into work.

Heat was transformed into work.

Heat will be transformed into work.

1. The car (to drive) by an engine. 2. Brakes (to use) to stop or slow down the speed of the car. 3. The steering wheel (to connect) to the front wheels. 4. Front wheels (to swing) to the left or right by some mechanisms. 5. Cars (to equip) with ventilation installations. 6. Energy (to transform) into mechanical work by machines.

5. Answer the following questions.

1. What does the automobile consist of? 2. What is the power plant?
 3. What does the power plant include? 4. What does the chassis consist of?
 5. What system does the chassis include? 6. Where does the power train carry the power?
 7. What does the power train consist of? 8. What does the body have?
 9. What is the body designed for? 10. What is it necessary to have to guide the car?
 11. What is connected to the front wheels for this purpose (to guide the car)?
 12. Why can the front wheels be swung?
 13. What are brakes necessary for? 14. What brakes are there in cars?

6. Topics for oral work:

1. Describe the three parts of the automobile. 2. Speak about brakes.

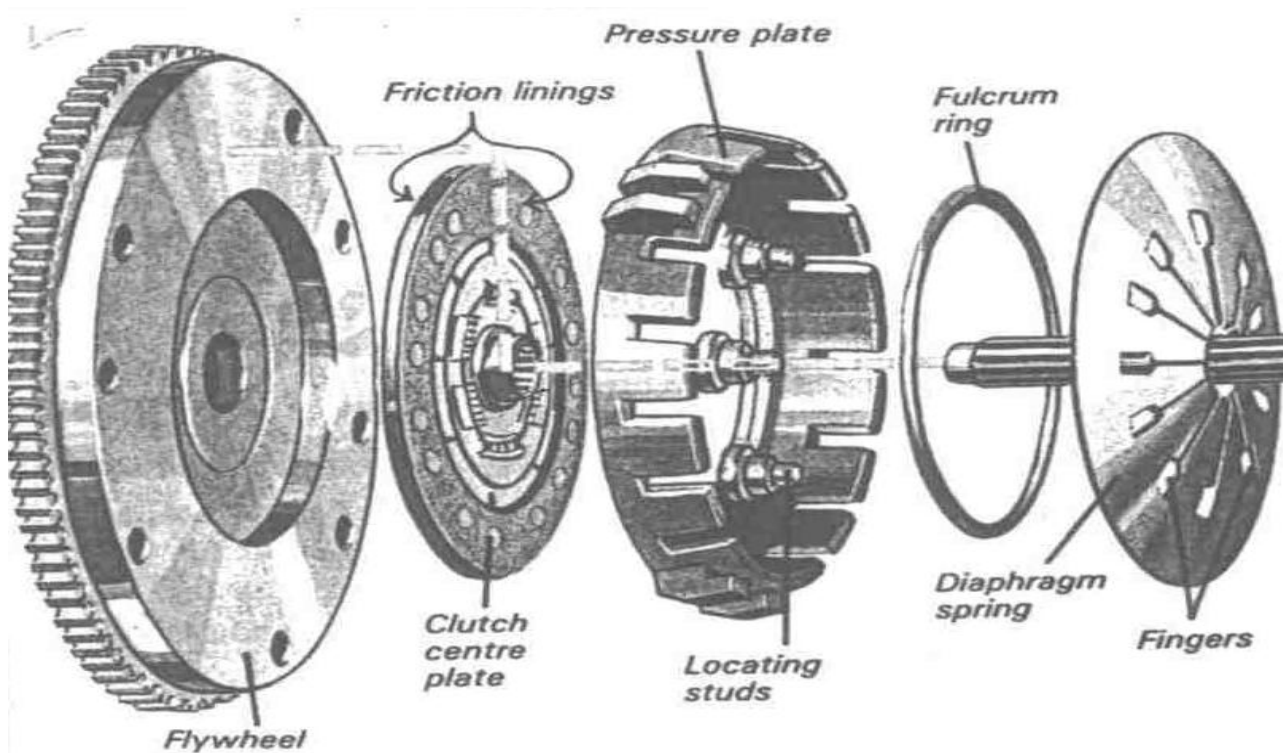
7. Make up short dialogues using the following situations:

1. You are interested in the arrangement of the automobile. You come up to the teacher and ask him to tell you the main things concerning the arrangement of the automobile.
2. You are a good driver. Comrade B. is going to be a driver. He wants you to tell him something about the operation of the automobile and its arrangement.

LESSON 3

Active Vocabulary

- | | |
|--------------------|--|
| 1. gear change | – переключение передач |
| 2. flywheel | – маховик |
| 3. drive | – привод, передача движения |
| 4. crankshaft | – коленчатый вал |
| 5. spline | – паз, шпонка |
| 6. to flatten | – сплющивать, раскатывать |
| 7. clutch plate | – дисковое сцепление, дисковая муфта |
| 8. friction clutch | – фрикционное сцепление, фрикционная муфта |
| 9. fluid coupling | – гидравлическое сцепление, гидравлическая муфта |
| 10. to deliver | – снабжать, подавать (энергию) |
| 11. oil | – смазка |
| 12. to agitate | – перемешивать |
| 13. to shift | – переключать |



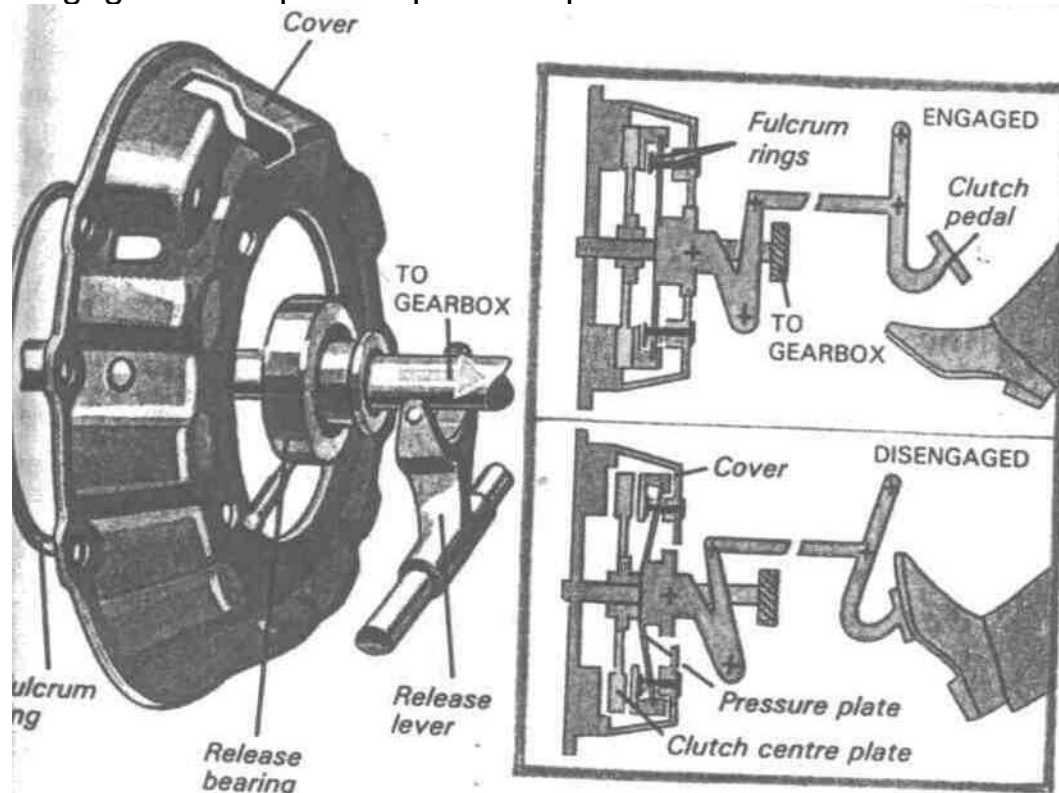
THE CLUTCH

In order to change gear it is necessary to disconnect the drive from the engine to the gearbox. This is done by means of the clutch which also has to be able to reconnect the engine smoothly, especially when the car is moving from rest.

The diagram shows a typical modern clutch. The drive from the engine comes via the flywheel which, as we have already seen, is bolted to the end of the crankshaft. The clutch plate, by means of the spline at its centre, drives the shaft to the gearbox and it itself driven by the flywheel through the friction linings. The clutch plate is clamped between the pressure plate and the flywheel and the clamping force is applied through the powerful diagram spring. This spring is initially conical but when it is assembled in the clutch it is flattened, and in trying to regain its original conical shape it exerts a strong clamping force on the pressure plate.

When the driver wishes to disengage the clutch he pushes on the clutch pedal which, through a system of levers, moves the release bearing to the left; this takes the load off the pressure plate and moves it away from the clutch plate. The clutch plate is then free and will not be driven by the engine.

To re-connect the drive, the driver releases the clutch pedal and the rate of re-engagement depends upon the speed with he moves his foot.



Some type of clutch is found in every car. The clutch may be operated by means of a foot pedal, or it may be automatic or semi-automatic. The friction clutch and the fluid coupling are the two basic varieties. The friction clutch, which depends on solid contact between engine and transmission,

consists of: the rear face of the flywheel; the driving plate, mounted to rotate with the flywheel; and the driven plate, between the other two. When the clutch is engaged, the driving plate presses the driven plate against the rear face of the flywheel. Engine power is then delivered through the contacting surfaces to the transmission.

Fluid coupling may be used with or without the friction clutch. When it is the sole means of engaging the engine to the transmission, power is delivered exclusively through an oil medium without any contact of solid parts. In this type, known as a fluid drive, an engine-driven, fan-bladed disc, known as the fluid flywheel, agitates the oil with sufficient force to rotate a second disc that is connected to the transmission. As the rotation of the second disc directly depends on the amount of engine power delivered, the prime result of fluid coupling is an automatic clutch action, which greatly simplifies the requirements for gear shifting.

LESSON 4

Active Vocabulary

- | | |
|----------------------|---|
| 1. steering | – рулевое управление |
| 2. a rack and pinion | – реечная передача (рейкой и шестерней) |
| 3. pinion | – шестерня, ведущая шестерня зубчатой пары |
| 4. steering wheel | – рулевое колесо, рулевое управление |
| 5. steering shaft | – вал рулевого управления |
| 6. rack | – зубчатая рейка |
| 7. track rod | – поперечная рулевая тяга |
| 8. spring | – пружина, рессора |
| 9. suspension | – подвеска |
| 10. bearing | – подшипник, опора |
| 11. axis | – ось |
| 12. caster action | – (стабилизирующее) действие продольного угла наклона поворотного шкворня |
| 13. steering gear | – рулевой механизм |
| 14. power steering | – рулевое управление с усилителем |
| 15. booster | – усилитель торможения |

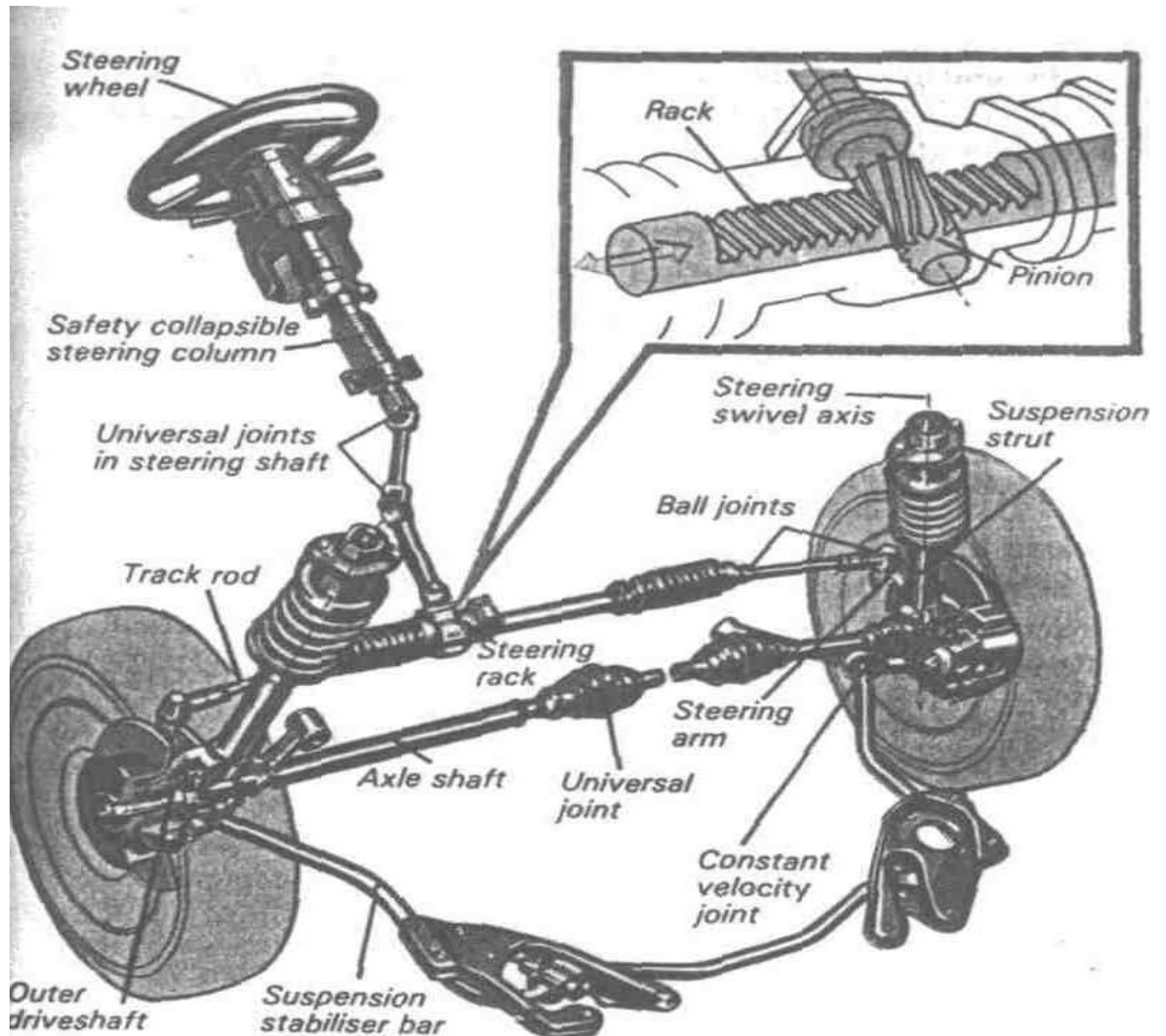
STEERING

All cars steer by turning the front wheels and nearly all modern cars do this by means of a rack and pinion as in the diagram. You will see that the pinion is a small gear which is turned by the steering wheel via the steering shaft. The rack is a flat set of gear teeth which is moved to and fro by the pinion, pushing one track rod and pulling the other, thus turning both wheels in the same direction about their respective swivel axle. The track rods have ball joints at each end to allow the wheels to move up and down with the

springing; these have to be carefully positioned so that the wheel movement does not affect the steering.

The suspension struts that support the car at the front are few to turn because there are bearings at the top and bottom and so these form the swivel axle for the front wheels.

These axles are not quite perpendicular to the road but lean inwards and backwards slightly at the top. This helps to make the steering lighter and produce castor action (as in a tea trolley) to straighten the wheels when coming out of a corner.



Steering is controlled by a hand wheel, mounted on an inclined column and attached to a steering tube inside the column. The other end of the tube is connected to the steering gear, which is designed to provide maximum ease of operation. Power steering, adapted for passenger cars in the early 1950s, is generally a hydraulic mechanism used as a booster to reduce the effort of steering.

A car has two sets of brakes: the hand or emergency brake and the foot brake. The emergency brake generally operates on the rear wheels only. The foot brake in modern cars is always of the four-wheel type, operating on all

wheels. Hydraulic brakes on cars and hydraulic vacuum, air, or power brakes on lorries apply the braking force to the wheels with much less force on the brake pedal than is required with ordinary mechanical brakes. The wheel brakes are generally of the internally type, in which a convex strip of material is forced against a concave steel brake drum.

LESSON 5

Active Vocabulary

1. U-shaped	– швеллерный
2. to weld	– сваривать
3. to rivet	– клепать
4. to reinforce	– укреплять
5. rigid	– устойчивый
6. vibration	– колебание
7. strain	– нагрузка
8. inherent	– свойственный
9. rubber pad	– резиновая прокладка
10. leaf spring	– листовая рессора
11. coil spring	– спиральная пружина

1. Choose the English equivalents to the following parts of the sentences.

- | | |
|--------------------------------|--|
| 1) швеллерные секции | a) semi elliptical sections
b) riveted sections
c) U-shaped sections
d) welded sections |
| 2) рессора спирального типа | a) spring of the leaf type
b) spring of the semi elliptical type
c) spring of the coil type |
| 3) опора для двигателя и колес | a) support for body and power-train members
b) support for engine and body
b) support for engine and power-train members |
| 4) тщательно сваренные секции | a) carefully riveted sections
b) carefully welded sections
c) carefully shaped sections |

Grammar: Perfect Tenses Active and Passive Voices

Models:

- Our country has developed the tractor industry since 1917.
- The tractor industry has been developed since 1917.
 - The tractor and car industries have been developed since 1917.

COMPONENTS OF THE AUTOMOBILE

Part II

The frame is the structural centre of any vehicles. It provides support for engine, body, wheels and power-train members. It is usually made of U-shaped sections. These U-shaped sections are carefully shaped and then welded or riveted together. Cross members reinforce the frame and also provide support for the engine and wheels. The frame is extremely rigid and strong. It can withstand the shock blows vibrations and other strains to which it is put on the road.

The engine is attached to the frame in three or four points. Noise and some vibrations are inherent in engine operation. To prevent this noise is insulated from the frame by some form of rubber pad at each point of support.

Springs. The weight of the car is transmitted to the axles and wheels by springs. Springs may be of the leaf type or of the coil type. The coil spring is a heavy steel coil. The leaf spring has been made in a number of forms.

The most commonly used type is the semi elliptical type. The leaf spring is made up of series of leaves, one on top of another. Both types of springs – coil and leaf – are usually insulated from the frame by means of rubber pads.

1. Put the verbs in brackets into the Present Perfect Passive.

Example: The tractor industry (to develop) in our country since 1917.

The tractor industry has been developed in our country since 1917.

1. Several types of tractors (to design) for work in agriculture.
2. The first vehicle (to build) by a Russian inventor.
3. Automobiles (to equip) with ventilation installations.
4. Automobile industry (to develop) in our country since 1920-s.
5. Tractors (to use) in industry.

2. Answer the questions.

1. What is the frame? 2. What does the frame provide? 3. What is it usually made of? 4. What are cross members used for? 5. How is the engine attached to the frame? 6. Why is the frame rigid? 7. What is the engine insulated from the frame by? 8. Of what types may springs be? 9. What is the most commonly used type of springs? 10. What is the leaf spring made of?

3. Topics for oral work.

- 1) Describe the structural centre of any vehicle.
- 2) Speak about the types of springs.

LESSON 6

Active Vocabulary

1. smooth	– ровный
2. a shock absorber	– амортизатор
3. oscillation	– тряска, вибрация
4. bump	– дорожная неровность
5. therefore	– поэтому, следовательно
6. to expand	– расширяться
7. liquid	– жидкость
8. to compress	– сжимать
9. to absorb	– поглощать
10. tube	– камера шины
11. inner	– внутренний
12. coating	– покрытие
13. tread	– протектор
14. to dampen	– тормозить

1. Fill in the necessary words in the right column.

- | | |
|---|----------------|
| 1) Tyres may be of the ... or pneumatic type. | shock absorber |
| 2) Tyres ... a considerable part of the road shock. | air-filled |
| 3) Some cars are equipped with ... tyres. | smooth |
| 4) ... usually operate on hydraulic action. | tubeless |
| 5) Spring provides a ... ride together with shock absorber. | absorb |

2. Choose the right definition to the following English terms.

- | | |
|-------------------|--|
| 1. Spring | a) are devices for transmitting the driving power of the wheels to the road. |
| 2. Shock absorber | b) are mechanisms for transmitting the weight of the car to the wheels |
| 3. Tyres | c) is the part of the tyre that makes contact with the road. |
| 4. The thread | d) are devices for damping out the spring oscillations. |

COMPONENTS OF THE AUTOMOBILE

Part III

Shock absorbers. Springs alone cannot provide a satisfactory smooth ride. Therefore an additional device is used with each spring. This device is called a shock absorber. Shock absorbers are used to prevent the oscillation of the spring. These devices dampen out the spring oscillations so that after

the wheel passes over a bump, the spring returns to its original position without expanding.

Shock absorbers usually operate on hydraulic action. They contain liquid that is forced from one cylinder to another as the springs are compressed or expanded.

Tyres. Tyres are of the air-filled or pneumatic type. Their function is to transmit the driving power of the wheels to the road through frictional contact. They also absorb a considerable part of the road shock due to small bumps and holes.

Many tyres use inner tubes. In recent years practically all new cars have been equipped with tubeless tyres.

Tyres are classified according to the quantity of air pressure in them into: high pressure tyres (4-5.5 atmosphere) and low pressure tyres (1.5-3.0 atmosphere). Low pressure tyres provide the comfort of driving due to their elasticity. With either type the tyre has a coating of rubber. This coating may be of different thickness. The part of the tyre that makes contact with road is called the tread.

3. Answer the following questions.

1. What device is called a shock absorber?
2. What are shock absorbers used for?
3. How do shock absorbers operate?
4. What is the function of tyres?
5. Has the tyre a coating of rubber?
6. What tubes do many tyres use?
7. How are tyres classified?
8. May the coating be of different thickness?
9. What part of the tyre is called the thread?

LESSON 7

Active Vocabulary

- | | |
|-------------------------------|----------------------------------|
| 1. depending on | – в зависимости от |
| 2. to convert | – превращать |
| 3. servicing system | – обслуживающая система |
| 4. internal combustion engine | – двигатель внутреннего сгорания |
| 5. prime mover | – перводвигатель |
| 6. secondary mover | – вторичный двигатель |
| 7. pressure | – давление |
| 8. to require | – требовать |
| 9. to consume | – потреблять |
| 10. mobile | – передвижной |
| 11. self-propelled | – самоходный |
| 12. to incorporate | – включать в себя |

1. Choose the English equivalents to the following parts of sentences.

- | | |
|--|--|
| 1) энергия, полученная из топлива | a) energy produced by generator
b) energy taken from fuel |
| 2) Самоходное дорожно-строительное оборудование | a) self-propelled machines
b) mobile road-making machinery
c) self-propelled road-making machinery |
| 3) Двигатель внутреннего сгорания | a) pneumatic engines
b) hydraulic engines
c) internal combustion engine |
| 4) Чрезвычайно эффективны в любых рабочих условиях | a) extremely efficient under hard conditions
b) extremely efficient under all working conditions |

Grammar: Participle II and its functions.

Models:

1. The energy produced by generators is converted into mechanical work.
2. When used internal combustion engines extremely efficient under all working conditions.

Power Installations of Road-Making and Construction Machinery

A power installation is a complex consisting of an engine and its servicing systems which convert some kind of energy into mechanical work.

Depending on the type of engine, power installations employed in present day road-making and construction machinery can be subdivided into the following groups: steam power, internal combustion, electric, pneumatic and hydraulic.

Steam engines and internal combustion engines are prime movers as they transform energy taken from fuel into mechanical work. Electric, pneumatic and hydraulic engines are secondary movers as they convert into mechanical work the energy produced by generators. The basic components of a steam power installation are a boiler and a steam engine. The boiler produces steam with the required pressure. The steam engine transforms the energy of the expanding steam into mechanical work. This engine operates on the principle of simple expansion of steam. When used these engines are more economical as they generate a greater power and consume less fuel.

Internal combustion engines are the principal power installation employed in mobile and self-propelled road-making machinery as well as in trucks and tractors. They are extremely efficient under all working conditions.

Electric power installations incorporate generators and motors. Electric generators transform mechanical energy into electrical energy. Electric

energy is then used to drive electric motors. Electric motors convert electric energy into mechanical work.

2. Put the following sentences into the Passive voice.

Example: Internal combustion engines transform energy taken from fuel into mechanical work.

Energy taken from fuel is transformed into mechanical work by internal combustion engines

1. Electric generators transform mechanical energy into electric energy.
2. The boiler produces steam with required pressure.
3. Engines generate power.
4. Electric motors convert electric energy into mechanical work.

3. Topics for oral work.

- 1) Speak about the types of engines.
- 2) Compare electric power installations and steam power installations.
4. Make up short dialogues using the following words and word combinations.
 - 1) a power installation, depending on, steam engines, internal combustion engines, hydraulic engines, convert;
 - 2) a boiler, the required pressure, expansion of steam, consume, working conditions;
 - 3) electric power installations, electric motors, electric energy, mechanical work.

LESSON 8

Active Vocabulary

- | | |
|-----------------------|-----------------------|
| 1. to propel | – управлять |
| 2. duration | – продолжительность |
| 3. succession | – последовательность |
| 4. revolution | – оборот |
| 5. four-stroke cycle | – четырехтактный цикл |
| 6. crankshaft | – коленчатый вал |
| 7. intake stroke | – такт впуска |
| 8. compression stroke | – такт сжатия |
| 9. power stroke | – рабочий ход |
| 10. exhaust stroke | – такт выпуска |
| 11. piston | – поршень |
| 12. connecting rod | – шатун |
| 13. to descend | – опускаться |
| 14. explosive | – взрывной |
| 15. to ignite | – воспламеняться |
| 16. ignition plug | – свеча зажигания |
| 17. spark | – искра |

18. top dead centre – верхняя мертвая точка
 19. bottom dead centre – нижняя мертвая точка

1. Choose the equivalents to the following terms.

- | | |
|--------------------|--------------------------|
| 1) crankshaft | a) искра |
| 2) connecting rod | b) свеча зажигания |
| 3) ignition plug | c) верхняя мертвая точка |
| 4) spark | d) оборот |
| 5) top dead centre | e) коленчатый вал |
| 6) power stroke | f) рабочий ход |
| 7) revolution | g) шатун |
| 8) succession | h) последовательность |

1. Find the English equivalents to the parts of sentences.

- | | |
|-----------------------------------|--|
| 1) Механически управляемые машины | a) electrically operated machines
b) hydraulically operated vehicles
c) mechanically operated vehicles |
| 2) Класс перводвигателей | a) the class of secondary movers
the class of prime movers |
| 3) Два оборота коленчатого вала | a) two revolutions of the wheel
b) two revolutions of the crankshaft |
| 4) Нижняя мертвая точка | a) bottom dead centre
b) top dead centre |

Grammar: 1. Model Verbs with the Infinitive.

2. Present Continuous Active and Passive Voices (Recapitulation).

Models: 1. Combustion engines may be divided into different types.

Engines can be subdivided into five types.

2. The plant is producing these types of engines.

These types of engines are being produced by the plant.

INTERNAL COMBUSTION ENGINE

The engines of all mechanically propelled vehicles belong to the class of prime movers. They are known as internal combustion engines.

Combustion engines may be subdivided according to the duration of the cycle on which they operate. Cycle is in succession of operations in the engine cylinder which constantly repeats itself.

Most engines operate on four cycle. Four stroke cycle is completed in time of two revolutions of the crankshaft. The four stroke cycle comprises the following four operations:

1. intake stroke
2. compression stroke
3. power stroke
4. exhaust stroke.

Intake stroke. The intake valve is open. The piston moves from the top dead centre (TDC) to the bottom dead centre (BDC). The top dead centre is the position of the piston when it is at the maximum distance from the crankshaft axle.

The bottom dead centre – is the position of the piston when it is closest to the crankshaft axle. As the crankshaft turns it pulls down on the connecting rod and the rod in turn pulls down on the piston. The piston descends in the cylinder, drawing in behind a charge of fuel-air mixture.

Compression stroke. The piston is at the bottom. Both valves must be closed. The crankshaft is turning. The connecting rod pushes the piston upwards and the explosive charge is compressed.

Power stroke. As the piston reaches the top of the cylinder the fuel-air charge is ignited by a spark at the ignition plug. The burning process produces heat. The heat makes the gases inside the cylinder expand and exert pressure on top of the piston. The piston is pushed down. Its motion is transmitted through the connecting rod to the crank. The force of the crank makes the crankshaft turn.

Exhaust stroke. The exhaust valve is opened. The piston moves from BDC to TDC and pushes the products of combustion through the exhaust valve out of the cylinder. The cylinder becomes clear and ready for the next cycle.

1. Translate into Russian paying attention to the combination of model verbs with the Infinitive:

1. Any rust which is present in the cylinder of the engine must be removed.
2. Electric motor can easily be switched off during idle periods.
3. Electric motors cannot be used on mobile and self-propelled vehicles which have no mains-voltage supply.
4. The engine must be attached to the frame in three or four points.
5. The front wheels can be swung to the left or right.
6. The leaf spring may be made in a number of forms.
7. A satisfactory smooth ride cannot be provided only by springs.

2. Answer the following questions, begin to answer with the expressions: *It seems to me, here are a few words about, just a few words about, I think.*

1. What are internal combustion engines?
2. How may combustion engines be divided?

3. What is a cycle?
4. In what time is a four-stroke cycle completed?
5. When is the inlet valve opened?
6. When is the exhaust valve closed?
7. When is the explosive charge compressed?
8. When is the fuel-air charge ignited?
9. What does the burning process produce?
10. Where does the piston go when the exhaust valve is opened?
11. When does the cylinder become ready for the next cycle?

LESSON 9

Active Vocabulary

1. fuel oil	– жидкое топливо
2. to inject	– впрыскивать
3. combustion chamber	– камера сгорания
4. injector	– форсунка
5. to burn	– сжигать
6. pump	– насос
7. carburettor	– карбюратор
8. replace	– замещать
9. air-injection	– воздушный впрыск
10. solid-injection	– безвоздушный впрыск
11. plug	– пробка, здесь: игла
12. spring-loaded valve	– пружинный клапан
13. heat of compression	– здесь: воспламенение от жидкости
14. to require	– требовать

1. Choose the equivalents to the following English terms.

1) air-injection	безвоздушный впрыск
2) combustion chamber	камера сгорания
3) fuel oil	пружинный клапан
4) solid-injection	жидкое топливо
5) spring-loaded valve	воздушный впрыск

DIESEL ENGINES

A diesel engine is an internal combustion engine in which fuel is ignited by the heat of compression. Any gas when it is compressed will become heated. In diesel engine the air drawn into the cylinder on the intake stroke is heated during the compression stroke. It is heated to a temperature much higher than required for ignition diesel fuel oils. When fuel oil is injected into

the combustion chamber it is ignited by the heated air. Its combustion rises the temperature still higher and expands the gases formed in burning to provide the power. This power moves the piston.

The fuel is injected either by mechanically operated pump or by compressed air. Neither carburettor nor ignition mechanism is used. They are replaced by the injection system.

The type of a diesel engine is based on the method of injection:

- 1) air injection
- 2) airless or solid injection.

The air-injection engines uses compressed air to force the fuel into the cylinder. The injector consists of a plug, a spring-loaded valve and a mechanical device.

Solid injection consists in forcing the fuel into the cylinder by means of mechanically operated pump.

1. Replace the subordinate clauses by the Past Participle. Translate them into Russian.

Example: The first vehicle which was built by a Russian inventor was put into motion by pedals.

The first vehicle built by a Russian inventor was put into motion by pedals.

1. The gas mixture which is produced by the carburettor is of no value unless it is ignited.
2. Gas which is ignited quickly produces more force if first compressed.
3. A steam engine uses steam which is burnt outside the engine.
4. The air which is drawn into the cylinder on the intake stroke is heated during the compression stroke.
5. Gases which are formed in burning provide the power.

2. Answer the following questions, using the expressions: *I think, I'd say, As far as I know, I am right in saying, It seems to me.*

1. What is a diesel engine?
2. When will gas become heated?
3. When is fuel oil ignited by the heated air?
4. How is the fuel ignited?
5. What is carburettor and ignition mechanism replaced by?
6. What is the type of a diesel engine based on?
7. What does the injector consist of?

3. Learn the dialogue.

- A. Can you tell me when a diesel engine was designed?
- B. As far as I know it was designed in 1879.
- A. Is it really so? Was it designed at that time?

- B. I am right in saying that.
 A. Oh, it's rather old, I'd say.
 B. Of course, it is. But it's younger than gasoline engines.
 A. You are right. Gasoline engines appeared about 35 years before the diesel engine.

LESSON 10

Active Vocabulary

1. majority	– большинство
2. to participate	– участвовать
3. intake port	– всасывающее устройство
4. exhaust port	– выхлопное отверстие
5. to lead	– вести
6. to admit	– впускать
7. combustible mixture	– горючая смесь
8. i.e. (that is)	– то есть
9. air-tight crankcase	– герметический картер
10. to reciprocate	– двигаться взад и вперед
11. scavenging port	– продувное отверстие
12. repetition	– повторение

1. Find the Russian equivalents to the following English terms.

- | | |
|-----------------------|----------------------------|
| 1) intake port | a) горючая смесь |
| 2) exhaust port | b) всасывающее устройство |
| 3) combustion mixture | c) продувное отверстие |
| 4) reciprocate | d) выхлопное отверстие |
| 5) scavenging port | e) двигаться взад и вперед |

Grammar: Participle I and its functions.

Models: 1. The port leading to the crankcase is open.

2. Fresh combustible mixture enters the space above the piston, thus preparing the cylinder for the repetition of the cycle.

3. Engine being the source of power makes the car move.

TWO-STROKE ENGINES

The majority of present-day internal combustion engines operate on four-cycle principle. Two-stroke engines are used in motor-cycles and starting devices for certain types of tractor engines. In a two-stroke engine all the four processes comprising the working cycle are completed during two strokes of the piston, i.e. during one revolution of the crankshaft.

The engine is provided with an air-tight crankcase which participates directly in the working process. Intake and exhaust ports in the walls of the

cylinder serve for admitting combustible mixture into the cylinder and exhausting the used gases from it. The ports are opened and closed by the piston reciprocating in the cylinder. During the first stroke the crankshaft and the connecting rod move the piston from bottom dead centre to top dead center. The port leading to the crankcase is opened and the combustible mixture is drawn into the crankcase. At the end of the piston stroke the mixture burns.

During the second stroke the expanding gases push the piston from TDC to BDC. At the beginning of the stroke the piston closes the intake port. At the end of the stroke it opens the exhaust port, through which the pressure of exhaust gases discharges them into the atmosphere.

In its further motion the piston opens scavenging port through which fresh combustible mixture enters the space above the piston, thus preparing the cylinder for the repetition of the cycle.

2. Translate into Russian;

the piston reciprocating in the cylinder, the process comprising the working cycle, crankshaft and connecting rod moving the piston from BDC to TDC, power moving the piston, the friction force arising between the wheels.

3. React to the statements expressing agreement or disagreement, make use of the following expressions: *There is no doubt about it.*

1. The frame of the car is extremely rigid and strong.
2. I believe some modern cars have a frameless structures.
3. Most vehicles operate on two-stroke cycle.
4. Tyres are of the air-filled or pneumatic type.

LESSON 11

Active Vocabulary

- | | |
|--------------------------|------------------------|
| 1. purpose | – цель |
| 2. to reduce | – уменьшать |
| 3. friction | – трение |
| 4. to rub | – тереть |
| 5. lubricant | – смазочное масло |
| 6. surface | – поверхность |
| 7. film | – тонкий слой, пленка |
| 8. to retard | – замедлять |
| 9. rapidly | – быстро |
| 10. to wear (wore, worn) | – изнашиваться |
| 11. to depend | – зависеть |
| 12. rough | – шероховатый |
| 13. loss of power | – потеря энергии |
| 14. to eliminate | – устранять, исключать |
| 15. due to | – благодаря чему-либо |

16. crankshaft bearing	– подшипник коленчатого вала
17. camshaft bearing	– подшипник кулачкового вала
18. to deliver	– подавать
19. to drain	– стекать
20. to feed (fed, fed)	– подавать
21. oil hole	– смазочное отверстие

1. Choose the equivalents to the following English terms.

1. lubricant	a) потеря энергии
2. friction	b) смазочное масло
3. crankshaft bearing	c) несущая поверхность
4. loss of energy	d) трение
5. camshaft bearing	e) подшипник коленчатого вала
6. bearing surface	f) подшипник кулачкового вала

Grammar: Absolute Participial Construction.

Models: 1. The friction being great, the loss of power is greater.

2. There are four-stroke engines and two-stroke engines, four-stroke engines being more widely used.

ENGINE LUBRICATION SYSTEM

The purpose of lubrication is to reduce the friction between moving surfaces. If parts rubbing on each other are not separated by a film of lubricant the surface will rapidly wear away. Friction is a force that retards or stops motion of one surface over another.

The frictional force depends on the nature of the surface and also on the kind of material. The rougher the surface and softer the material, the greater the friction. The harder the material and the smoother the surface, the less the friction. The friction being great, the loss of power is greater.

A great amount of friction is necessary in certain parts of the car such as in the brakes, the clutch, and the outer surfaces of the tyres.

It is impossible to eliminate the friction entirely. The loss of power can be reduced to a minimum due to proper use of suitable lubricants.

The principal parts of the engine needing lubrication are the main crankshaft bearings, camshaft bearings, piston and cylinder walls. Oil may be fed to a bearing in two ways. It may be delivered into an oil hole located above the bearing. From there it drains to the bearing surface.

Or it may be fed directly to the bearing surface under pressure. Practically all modern engines employ pressure lubrication.

2. Translate into Russian paying attention to the Absolute Participial Constructions:

1. The piston reaching the top of the cylinder, the fuel-air charge is ignited.

2. The exhaust valve being opened, the piston goes up and pushes products of combustion out of the cylinder.
3. The products of combustion being pushed away out of the cylinder, the cylinder becomes ready for the next cycle.
4. The piston being at the top of the cylinder, the inlet valve is opened.
5. Electric generators transform mechanical energy into electric energy being used to drive electric motors.
6. The applied force being removed, the gas returns to its original volume.

3. Translate into Russian.

Example: The rougher the surface, the greater the friction.

1. The smoother the surface, the less the friction.
 2. The more friction there is, the greater the loss of power.
 3. The more cylinders there are, the smoother the engine will run.
 4. The greater the coefficient of friction, the greater the friction force.
 5. The more heat involved during combustion, the greater the power developed by the engine.
4. Answer the following questions, using the expressions: *I'd say, It seems to me, To my mind, As far as I know, As far as I remember.*

1. What is the purpose of the lubrication?
2. What is friction?
3. What does the friction force depend on?
4. In what parts of the car is a great amount of friction necessary?
5. Is it possible to eliminate the friction entirely?
6. What parts of the engine need lubrication?
7. In how many ways may be oil fed to a bearing?
8. What lubrication do modern engines employ?

LUBRICATION

In the force-feed system, a pump forces the oil to the main crankshaft bearings and then through drilled holes in the crankpins. In the full-force system, oil is also forced to the connecting rod and then out to walls of the piston pin.

COOLING

At the moment of explosion, the temperature within the cylinder is much higher than the melting point of cast iron. Since the explosions take place as often as 2,000 times per minute in each cylinder, the cylinder would soon become so hot that the piston, through expansion, would "freeze" in the cylinder. The cylinders are therefore provided with jackets, through which water is rapidly circulated by a small pump driven by a gear on the crankshaft or camshaft. During cold weather, the water is generally mixed with a suitable antifreeze, such as alcohol, wood alcohol, or ethylene glycol.

To keep the water from boiling away, a radiator forms part of the engine-cooling system. Radiators vary in shape and style. They all have the same functions, however, of allowing the water to pass through tubing with a large

area, the outer surface of which can be cooled by the atmosphere. In air cooling of engine cylinder, various means are used to give the heat an outlet and carry it off by a forced draught of air.

LESSON 12

Active Vocabulary

1. universal joint	– карданное сцепление
2. universal drive	– карданная передача
3. an axle shaft	– полуось
4. drive	– движение
5. through	– через
6. live back axle	– ведущий задний вал
7. bevel gearing	– коническая поверхность
8. to convey	– передавать
9. driving wheel	– ведущее колесо
10. to enable	– давать возможность
11. to disconnect	– расцеплять
12. to keep	– здесь: удерживать
13. engaged position	– сцепленное состояние
14. to effect	– осуществлять
15. leverage	– рычажная передача, крутящий момент
16. relatively	– относительно
17. to vary	– изменяться
18. to permit	– позволять

1. Choose the correct equivalents to the following English terms.

1. ведущий задний мост	a) driving wheel
2. крутящий момент	b) live back axle
3. ведущее колесо	c) universal joint
4. коническая поверхность	d) leverage
5. карданное сцепление	e) bevel gearing

Grammar: Infinitive and its functions

Models: 1. To guide the car is not easy.

2. The functions of lubrication is to reduce the friction between moving surfaces.

3. I want to know something about the construction of a tractor.

4. Shock absorbers are used to prevent the oscillation of the springs.

TRANSMISSIONS

The term "transmission" includes the entire mechanism between the engine and the rear wheels. The entire mechanism consists of a clutch, a

gear box, a universal drive, a final drive, a differential and axle shafts. The engine is situated at the front of the car. Its crankshaft is parallel to the centre line of the car. From the engine the drive is transmitted through a clutch and a short shaft to the gear box. From the gear box the drive is then taken by a propeller shaft to the live back axle.

The propeller shaft has a universal joint at each end. Bevel gearing turns the drive round through 90 ° and shafts convey it to the driving wheels.

The function of the clutch is to enable the engine to be disconnected smoothly from the driving wheels. A spring keeps the clutch in the engaged position. Disengagement is effected by the pressure of the foot on a pedal. Therefore the driver must be sitting in the car to disengage the clutch.

The principal function of the gear box is to enable the leverage between the engine and the driving wheels to be varied. The universal joints permit the back axle to move up and down relatively to the frame when the road is not smooth.

2. Answer the following questions.

1. What does the term “transmission” include?
2. What does the entire mechanism consist of?
3. Where is the engine situated?
4. Where is the drive transmitted from the engine?
5. By what mechanism is the drive taken to the live back axle?
6. 6. What has the propeller shaft at each end?
7. What is the function of the clutch?
8. What is disengagement effected by?
9. What is the principal function of the gear box?

MANUAL AND AUTOMATIC TRANSMISSIONS

The transmission is a mechanism that changes speed and power ratios between the engine and the driving wheels. Three general types of transmission are in current use: conventional or sliding-gear, Hydra-Matic, and torque-converter systems.

The conventional transmission provides for three or four forward speeds and one reverse speed. It consists of two shafts, each with gears of varying diameters. One shaft drives the other at a preselected speed by meshing the appropriate set of gears. For reverse speed, an extra gear, known as the idler gear, is required to turn the driven shaft in the opposite direction from normal rotation. In high gear, the two shafts usually turn at the same speed. In low, second, and reverse gears, the driven shaft turns more slowly than the driving shaft. When a pair of gears permits the driven shaft to turn more rapidly than the driving shaft, the transmission is said to have overdrive. The Hydra-Matic type of transmission combines the automatic clutch provided by fluid coupling with a semiautomatic transmission. A mechanical governor, controlled by the pressure exerted on the accelerator pedal, regulates gear selection through a

system of hydraulically controlled shift valves. Hydra-Matic transmission provides for several forward gears.

The torque-converter type of transmission provides an unlimited number of gear ratios with no shifting of gears. The torque converter is a hydraulic mechanism using engine power to drive a pump, which impels streams of oil against the blades of a turbine. The turbine is connected to the drive shaft and causes it to rotate.

Both Hydra-Matic and torque-converter systems are controlled by a selector lever on the steering column, which provides also for reverse and sometimes for emergency-low gears.

ADDITIONAL TEXTS

THE FUEL SYSTEM

A mixture of petrol and air is burnt in the engine to provide the energy to drive the car. The petrol has to be stored in the *fuel tank* and supplied to the engine via the *carburettor* as required. Petrol is highly inflammable and its vapour when mixed with air in a confined space can be explosive. The petrol tank therefore is located away from the engine. It is also positioned so that it will not burst in the event of an accident when sparks could start a serious fire.

With the engine at one end of the car and the fuel tank at the other, a pump is necessary to send the fuel from the tank to the carburettor. The fuel pump is driven by the engine, usually from an additional cam on the camshaft. The operating rod moves up and down and works a diaphragm which is held at its circumference and moved by the rod at its centre.

Thus, when the rod moves downwards the diaphragm moves down and petrol is drawn through the one-way valve on the right. When the rod moves upwards the one-way valve closes and the fuel above the diaphragm is pushed out to the engine through the one-way valve on the left closes so that the fuel cannot be sucked back from the engine while the valve on the right opens allowing more fuel to be taken from the tank.

The fuel tank holds enough petrol for about 500 km (310 miles) running, (about 55 litres (12 gallons) for a medium size car). A sensor in the tank sends a signal to the fuel gauge on the dashboard to tell the driver how much fuel there is left in the tank.

THE CARBURETTOR

The function of the carburettor is to mix air with petrol from the fuel system in the correct proportion (about 15 parts of air to 1 of petrol by weight) and then to pass the mixture to the engine for burning in the cylinders.

Petrol is supplied to the float chamber from the fuel system and the needle valve shuts off the flow when the correct level is reached. Air is drawn

via an air cleaner or filter through the choke tube by the pistons of the engine when they are on their induction strokes; it is made to pass through a reduced area known as the *venturi* at the point where the tube from the float chamber protrudes into the choke tube.

This has the effect of reducing the pressure there, so that the atmospheric pressure within the float chamber can push the petrol out into the choke tube. On its way it has to pass through the main jet which restricts the flow; at the end of the tube where it emerges there are a number of radial drillings that cause the petrol to form a uniform mist in the airstream as it enters the cylinder.

The flow of combustible mixture and hence the speed and power output of the engine is controlled by the *throttle butterfly* which is opened when the driver presses the *accelerator*.

When the engine is being started from cold, a richer mixture is required. To achieve this the choke flap is partially closed either by the driver or automatically. This restricts the flow of air and increases the suction on the petrol passing through the main jet.

Many high performance and racing cars use petrol injection instead of a carburettor. A throttle butterfly operated by the accelerator pedal regulates the amount of air passing into the cylinder while a pump pressurizes the petrol which is then squirted directly into the cylinders through injectors. The timing and the quantity of petrol injected can be precisely controlled by electronic means.

TWO-STROKE AND DIESEL ENGINES

Most diesels are also four-stroke engines. The first or suction stroke draws air, but no fuel, into the combustion chamber through an intake valve. On the second or compression stroke the air is compressed to a small fraction of its former volume and is heated to approximately 440° C by this compression. At the end of the compression stroke vaporized fuel is injected into the combustion chamber and burns instantly because of the high temperature of the air in the chamber. Some diesels have auxiliary electrical ignition systems to ignite the fuel when the engine starts and until it warms up. This combustion drives the piston back on the third or power stroke of the cycle. The fourth stroke is an exhaust stroke.

The efficiency of the diesel engine is greater than that of any petrol engine and in actual engines today is slightly over 40 per cent. Diesels are in general slow-speed engines with crankshaft speeds of 100 to 750 revolutions per minute (rpm) as compared to 2,500 to 5,000 rpm for typical petrol engines. Some types of diesel, however, have speeds up to 2,000 rpm. Because diesels use compression ratios of 14 or more, they are generally more heavily built than petrol engines, but this disadvantage is counterbalanced by their greater efficiency and the fact that they can be operated on less expensive fuel.

DIRECT-CURRENT (DC) GENERATORS

If an armature revolves between two stationary field poles, the current in the armature moves in one direction during half of each revolution and in the other direction during the other half. To produce a steady flow of unidirectional, or direct, current from such a device, it is necessary to provide a means of reversing the current flow outside the generator once during each revolution. In older machines this reversal is accomplished by means of a commutator (коллектор) – a split metal ring mounted on the shaft of the armature. The two halves of the ring are insulated from each other and serve as the terminals of the armature coil. Fixed brushes of metal or carbon are held against the commutator as it revolves, connecting the coil electrically to external wires. As the armature turns, each brush is in contact alternately with the halves of the commutator, changing position at the moment when the current in the armature coil reverses its direction. Thus there is a flow of unidirectional current in the outside circuit to which the generator is connected. DC generators are usually operated at fairly low voltages to avoid the sparking between brushes and commutator that occurs at high voltage. The highest potential commonly developed by such generators is 1500 V. In some newer machines this reversal is accomplished using power electronic devices, for example, diode rectifiers.

Modern DC generators use drum armatures that usually consist of a large number of windings set in longitudinal slits in the armature core and connected to appropriate segments of a multiple commutator. In an armature having only one loop of wire, the current produced will rise and fall depending on the part of the magnetic field through which the loop is moving. A commutator of many segments used with a drum armature always connects the external circuit to one loop of wire moving through the high-intensity area of the field, and as a result the current delivered by the armature windings is virtually constant. Fields of modern generators are usually equipped with four or more electromagnetic poles to increase the size and strength of the magnetic field. Sometimes smaller interpoles are added to compensate for distortions in the magnetic flux of the field caused by the magnetic effect of the armature.

DC generators are commonly classified according to the method used to provide field current for energizing the field magnets. A series-wound generator has its field in series with the armature, and a shunt-wound generator has the field connected in parallel with the armature. Compound-wound generators have part of their fields in series and part in parallel. Both shunt-wound and compound-wound generators have the advantage of delivering comparatively constant voltage under varying electrical loads. The series-wound generator is used principally to supply a constant current at variable voltage. A magneto is a small DC generator with a permanent-magnet field.

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