

THE



AUTOMOBILE



HARBANS SINGH REYAT



The Automobile

1. Automobile. An automobile is a self-propelled vehicle which is used for the transportation of passengers and cargo over the ground.

2. Vehicle. Vehicle is a machine which is used for the transportation of passengers and cargo. Vehicle consists of two parts, i.e. carriage portion and machine portion. Vehicles used upon the ground contain wheels and axle as the main machine portion.

The development of the vehicle started from Sledge—Wheel Barrow—Cart—Wagon to Modern Vehicle.

3. Self-propelled Vehicle. A self-propelled vehicle is that in which power required for propulsion purposes is produced from within. Aeroplane, ship, motor-boat, locomotive; car, bus, truck, motor cycle, scooter etc. are examples of self-propelled vehicles.

4. Motor Vehicle. It is a vehicle which contains motor (D.C. Motor or Engine) to drive it. Motor Vehicle is another popular name for the automobile.

Vehicle + Motor = Motor Vehicle.

Cars, buses, trucks, motor cycles, scooters etc. are the different types of motor vehicles.

5. Types of Automobiles. Automobiles can be classified with different regards which are as under :

(a) With regard to the purpose these are built for :

(i) Passenger carriers.

(ii) Goods carriers.

(b) With regard to the fuel used :

(i) Steam carriages (Obsolete).

(ii) Electric Cabs (Rare).

(iii) Petrol or Gasoline Automobiles.

(iv) Diesel Vehicles.

(c) With regard to the number of wheels :

(i) Six-wheeler.

(ii) Four wheeler.

- (iii) Three wheeler.
- (iv) Two wheeler.
- (d) With regard to the drive of the vehicle :
 - (i) Six wheel Drive Vehicles.
 - (ii) Four wheel Drive Vehicles.
 - (iii) Two wheel Drive Vehicles.
 - (iv) Single wheel Drive Vehicles.
- (e) With regard to their construction :
 - (i) Single unit vehicles.
 - (ii) Articulated vehicles and tractors.
- (i) **Single unit vehicles.** Single unit vehicles range from 2 to six wheels and onward. Usually 4 wheelers and onward are

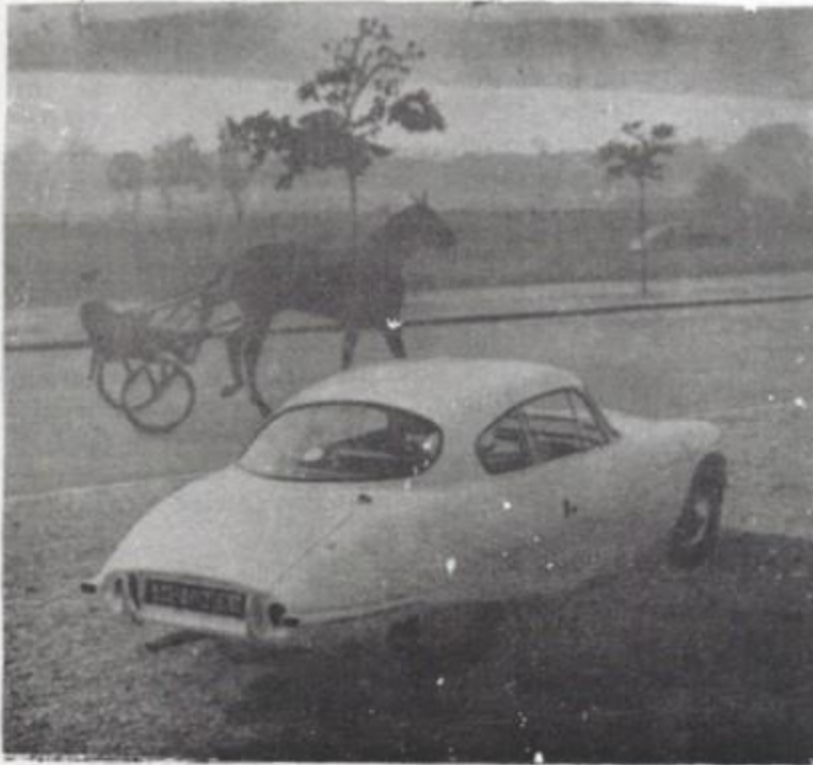


Fig. 1-1. Panhard CD Front wheel drive car.

considered under this category. Depending upon type of drive, these vehicles are known as two wheel, four wheel and six wheel drive vehicles and are denoted as 4×2 , 4×4 and 6×6 respectively, in which the first figure denotes the total number of wheels and the second figure the number of driving wheels. In a 4×2 vehicle, the drive could be at the front wheels or at the rear

ones. In majority of two wheel drive vehicles, there are two axles and drive is given to rear wheels. In Ambassador and Premier cars, the drive goes to rear wheels whereas in Panhard CD and D.K.W. cars, the drive is given to front wheels. In order to clarify the drive, the driving axle is denoted by the letter x and non-driving axle by the letter o . This way Ambassador and Premier cars will belong to ox class and Panhard CD and DkV cars to xo . Keeping this in view, the single unit vehicles could be classified as under :

- (i) ox : 4×2 , four wheeler, rear wheel drive vehicle.
- (ii) xo : 4×2 , four wheeler, front wheel drive vehicle.
- (iii) xx : 4×4 , four wheeler, four wheel drive vehicle.
- (iv) oxx : 6×4 , six wheeler, drive to both rear axle wheels.
- (v) xxx : 6×6 , six wheeler, six wheel drive vehicle.

(ii) **Articulated vehicles and Tractors.** The articulated vehicle is made up of two units, viz. (a) tractor unit and (b) trailer unit. The tractor unit acts as a horse to pull the trailer unit which is a carrier for load. The trailer is partially superimposed on the tractor which carries an appreciable part of the trailer weight. Thus the articulated vehicle resembles with that of a horse driven carriage or cart. As the horse can be removed away from the carriage, similarly the tractor can be disconnected from the trailer or *vice versa*. The cart is also superimposed partially on the horse back like the trailer on tractor, and carries an appreciable part of

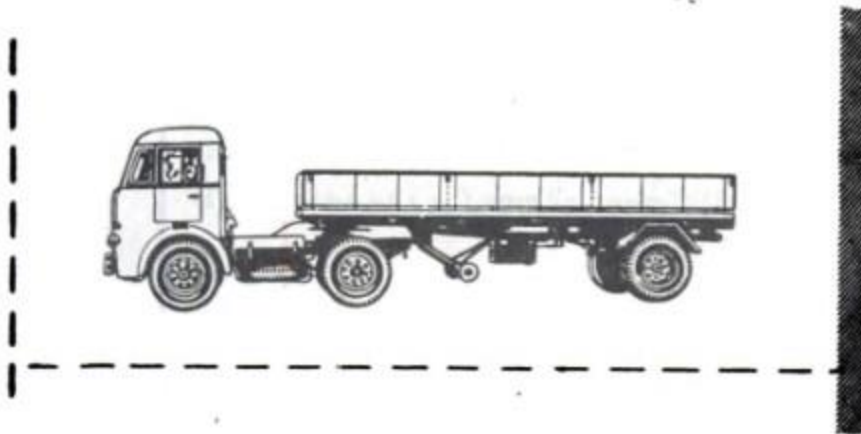
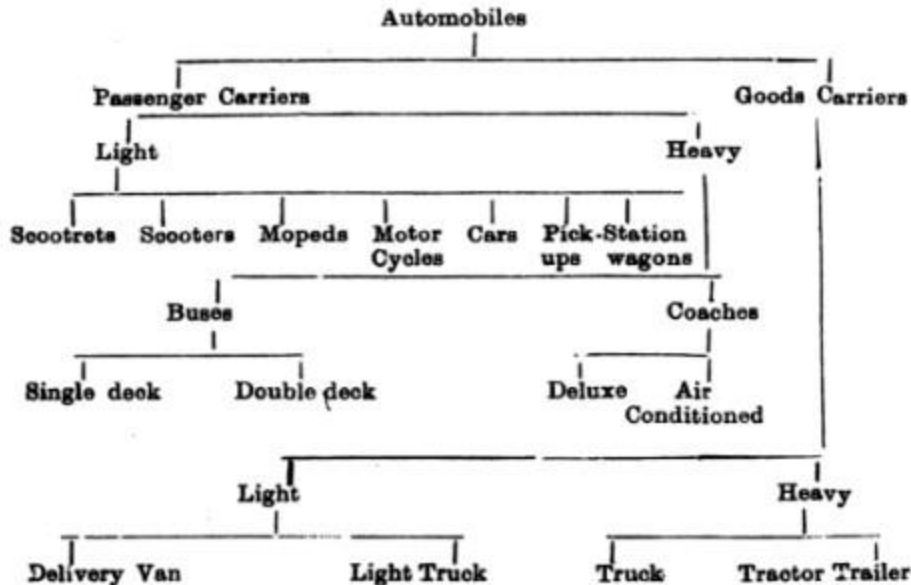


Fig. 1-2. Articulated vehicle

cart load. The tractor takes the place of horse and horse drawn carriage takes the shape of horseless self-propelled carriage known as articulated vehicle.

Usually tractor units of articulated vehicles belong to *ox* category. The coupling arrangement between tractor and semi-trailer is simple. In majority of the cases, all the connections are automatically made by reversing the tractor in position. The tractor is uncoupled through the operation of a lever in driver's cab. The semi-trailer is fitted with a pair of retractable wheels in the front, which are raised and lowered at the time of coupling and uncoupling.

For carrying very heavy loads *independent tractors* are also used. They are of *ox* or *oxx* class. They usually move in pairs, one after the other in tandem form or one acting as *puller* and the other as *pusher* to provide stability where appreciable gradients are to be descended. In such arrangements, there is usually telephonic communication between the two cabs and the braking system could be controlled from the cab in the leading tractor.



6. Different names for the automobile :

- (i) Automobile
- (ii) Auto
- (iii) Auto Gar
- (iv) Auto Buggy
- (v) Car
- (vi) Motor
- (vii) Motor Coach
- (viii) Motor Vehicle
- (ix) Motor Wagon
- (x) Horseless Carriage

7. Parts of an automobile. Every automobile consists of two main parts i.e.,

- (a) Machine portion, i.e. Chassis
- (b) Carriage portion, i.e., Body

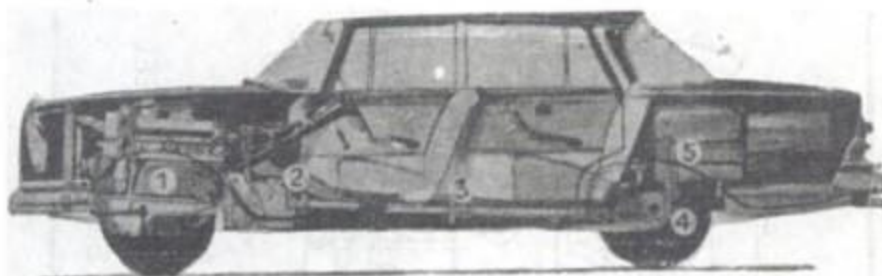


Fig. 1-3. An Automobile (in cut section)

- | | | |
|--------------|-------------------|--------------------|
| 1. Engine | 2. Gearbox | 3. Propeller shaft |
| 4. Rear Axle | 5. Shock Absorber | |

8. Chassis. It is machine portion of the automobile which carries the carriage portion. It is the automobile less body.

Chassis = Automobile — Body.

The chassis contains almost all those parts of an automobile which are necessary to drive the vehicle. It consists of the following main parts :

(i) **Frame.** It is the main structure around which all the other parts are connected or suspended to form chassis.

(ii) **Springs, shock-absorbers, axles and wheels.** These are the main parts of the suspension system of an automobile with the help of which chassis frame is put on legs and is able to roll on smoothly on the ground.

(iii) **Power Unit or Engine.** Power plant to develop the requisite power for the propulsion of an automobile.

(iv) **Clutch, Gearbox (Transmission), Propeller Shaft Differential and half-shafts or axle shafts.** These are the main constituents of the transmission line through which power developed by the engine is transmitted to the wheels of an automobile.

(v) **Steering, Brakes, Accelerator.** These are the main controls by means of which the vehicle is turned to right or left, stopped and engine speed which ultimately affects the speed of the vehicle, is controlled respectively.

(vi) **Fuel Tank.** A tank or reservoir for carrying fuel with the vehicle.

(vii) **Battery.** An electro-chemical apparatus to provide electric current for various electrical appliances in an automobile.

(viii), Lamps, Gauges, Switches, Controls, etc. Lamps provide eyes to the vehicle whereas gauges serve as indicators and with the help of switches and controls, the vehicle is operated.

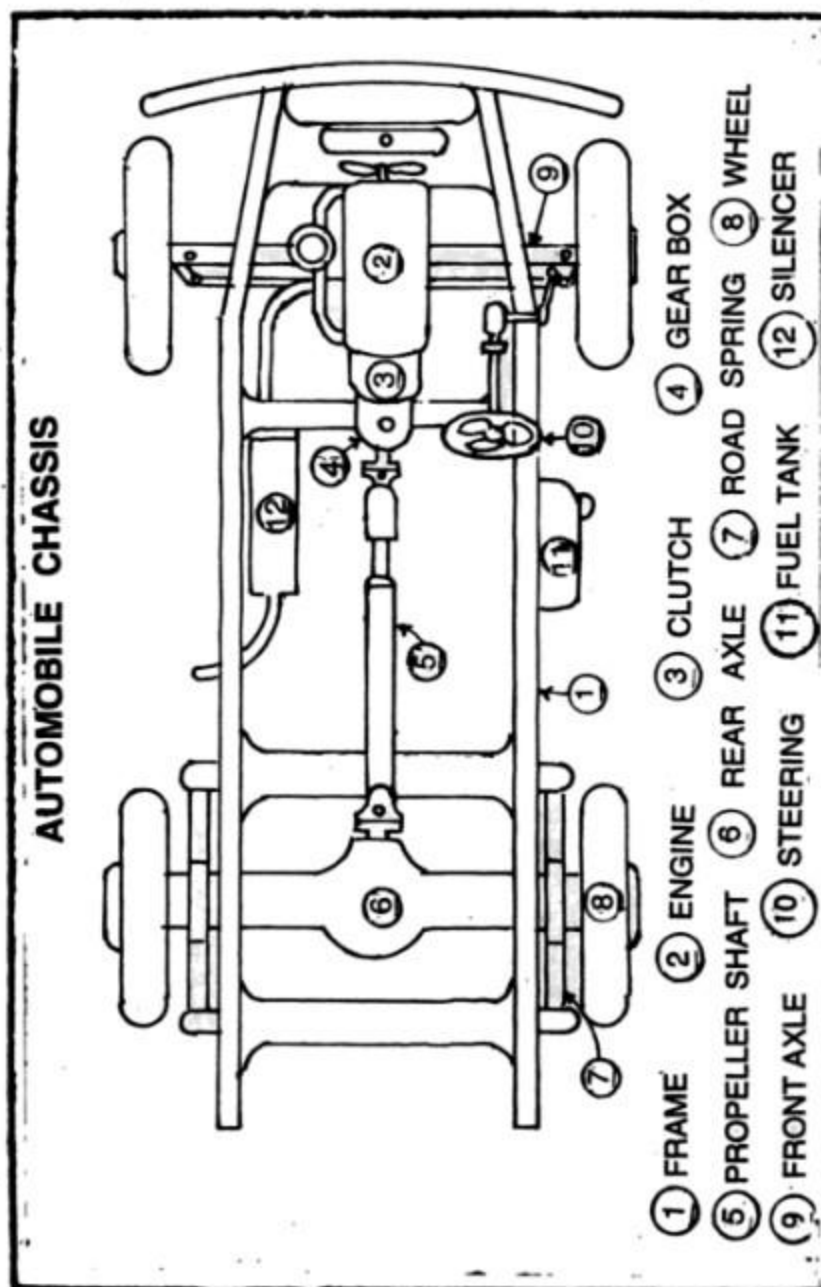


Fig. 1-4.

wood and steel or steel alone. Modern research has led to the development of plastic body.

In trucks, tractors and certain other vehicles, a separate cabin known as Cab, is provided for the driver where the instrument panel and controls are housed.

10. Description of automobile. In order to write down the description of an automobile, the following factors should be taken into consideration so that a clear picture is obtained :

(i) **Type.** Whether bus, truck, car, motor cycle etc.

(ii) **Capacity.** Carriage capacity—whether 5 ton, 3 ton, one ton, 15 cwt., $\frac{1}{2}$ ton, 4 seater, 6 seater, 30 seater, 45 seater etc.

(iii) **Make.** It is the actual name allotted by the manufacturer. In most cases, the make also indicates capacity/H.P. of the engine fitted in the vehicle, such as *Maruti 800*. This means that in Maruti make of car 800 c.c. engine, the total piston-displacement is about 800 c.c. (roughly equal to 8 H.P.).

Similarly, *Contessa Classic 1.8 CL* indicates that *Contessa* make of car employs gasoline (petrol) engine of 1.8 litre (1800 c.c.) capacity, which amounts to about 18 H.P., whereas the exact total piston-displacement is 1817 c.c.

(a) **Right hand or left hand drive.** Which means whether the steering is fitted on the right side or left side.

(b) **Two wheel drive ; 4 wheel drive ; 6 wheel drive.** This means as to how many wheels the engine power flows or how many wheels are directly connected with the engine.

In majority of the cars the engine power flows to the rear wheels only and the front wheels are fitted on the dead axle. These types of cars are known as two wheel drive vehicles. In certain vehicles, like Jeep, all the wheels are directly in contact with engine and the engine power could be transmitted to all the four wheels.

Drive is usually indicated as under :

Left Hand Drive ; 4×4 (4 wheel Drive)

Or

Left Hand, Four Wheel Drive, 4×4 means that the vehicle contains four wheels and the engine power could flow towards all the four wheels.

6×4 means that there are six wheels but the engine power could flow towards four wheels only.

(v) **Model.** Year of manufacture or special Code Number allotted by the manufacturer.

Hence in order to mention the description of an automobile, the following information shall be required :

- (i) Type
- (ii) Capacity
- (iii) Drive
- (iv) Make
- (v) Model

Example. In order to give description of a Jeep, it shall have to mention like this :

Car 6-seater, 4 WD (4×4), Jeep, Mahindra MM-540, DP (Diesel), wherein—

(i) *Type*—Car ; (ii) *Capacity*—6 seater ; (iii) *Drive*—4 Wheel Drive (4×4) ; (iv) *Make*—Jeep Mahindra ; (v) *Model*—MM-540 DP (employing diesel engine).

11. History of Automobile. The invention of the automobile is not the product of a single mind, of a single country or of a single generation in any country. Many men of different generations in different countries are responsible for its evolution and development.

In 15th century, Leonardo Da Vinci felt the possibility of self-propelled vehicles. Sir Issac Newton suggested a steam carriage to be powered by a rearwardly directed jet of steam in 1680, but his suggestion was not seriously considered up to some last years of 19th century.

Christian Huyghens, a Dutch experimenter, described the first Internal Combustion Engine few years before the proposal of Mr. Newton. He showed a single cylinder and single piston engine in which combustion took place by means of gun powder.

These were just the different rising ideas to convert horse drawn carriage into horseless carriage in the different corners of the universe. The dawn of the actual history of automobile is generally agreed to be in 1769 A.D. when Captain Nicholas Cugnot of France, built the actual self-propelled road vehicle. It was a three wheeled carriage propelled by steam engine. Its engine was driving the front single wheel. The boiler of the engine was projecting towards front of the vehicle. This carriage had to stop after about every hundred feet to develop steam.

the performance of this vehicle although it struck to a wall. The military officers asked Captain Cugnot to build another vehicle which could run at 8 m.p.h. carrying four to five tons of weight. Their main object was to transport guns and ammunition.

Some historians are of the view that Captain Cugnot's second self-propelled carriage was produced in 1771 and was preserved in Conservatoire Des Arts of Meters, Paris.

The birth of Captain Cugnot's steam carriage gave much inspiration to other persons and as a result efforts were started to convert horse drawn carriage into horseless carriage in the other countries too. This gave rise to the production of steam carriages.

Richard Trevithick built England's first full sized steam carriage in 1801. Other steam carriages in England were built by W.H. James who introduced variable ratio transmission, Walter Hancock, who used the first brake, and Goldsworthy Gurney. All of them

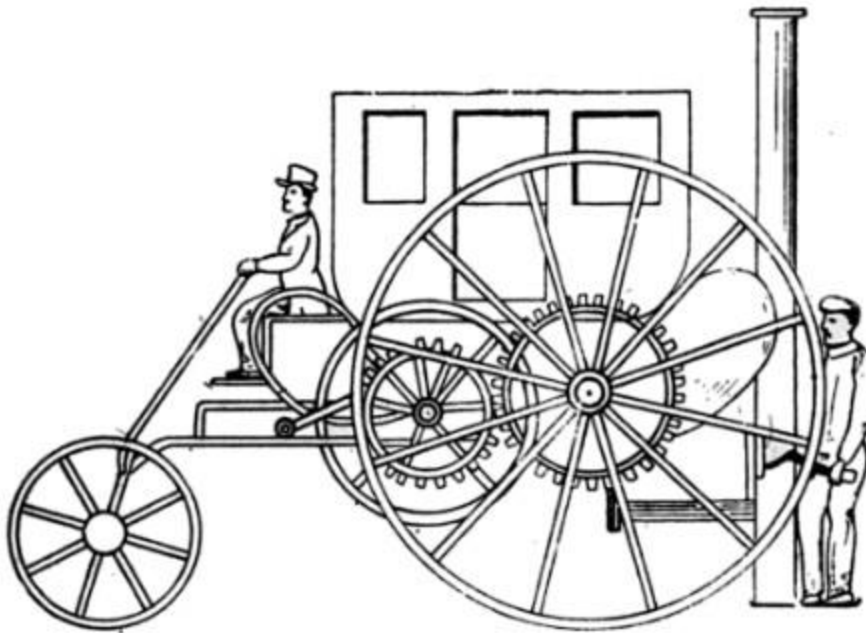


Fig. 1-7. Richard Trevithick's famous steam carriage of 1803.

were working on the development of steam carriages in the period between 1825 and 1836.

In France, Onesiphore Pacquaur took out a patent on the differential for road vehicles in 1827.

Oliver Evans received the first American patent for self-propelled road vehicle in 1789. Sixteen years later, Oliver Evans demonstrated the first steam vehicle in America. In 1829 William James too contributed in the development of steam carriage in America.