CARS: THE 20th CENTURY VEHICLES

TEACHING HANDBOOKS N. 8

MUSEUM OF SCIENCE AND TECHNOLOGY OF CATALONIA (MNACTEC)

SALVADOR CLARET'S CAR COLLECTION

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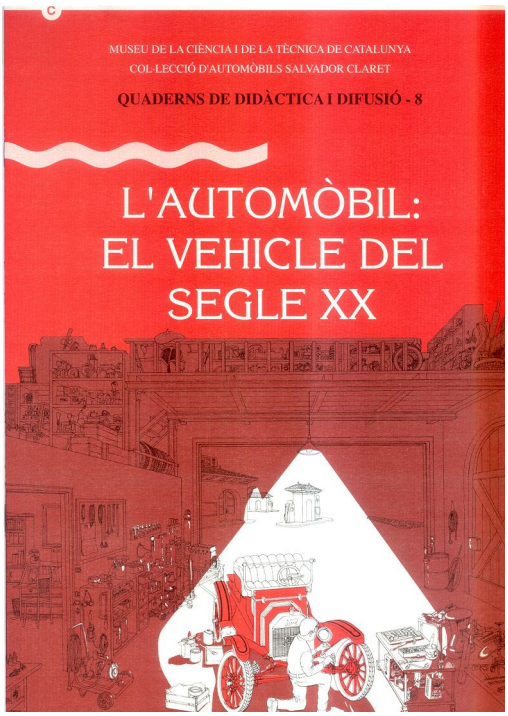

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TRAVELLING: FROM ANIMAL POWER TO INTERNAL COMBUSTION ENGINE

From the beginning of history, humanity has walked a lot from place to place. In the western world, Romans made easy going on foot by building up a net of cobbled paths, called 'vias', of more than 85.000 kilometres, which communicated the different European places under the Roman dominion. This net facilitated the trade relations and the military power throughout the whole Empire. Even today, the criteria of the Roman layout coincide with most of the roads built up by the present-day public works' engineers.

During the Middle Ages, roads were ruined; consequently, they were hindering the possibilities of land communication until well into the eighteenth century. The introduction of rigid horse-collars for cart-animals, especially for horses (4a), and stirrups (4b) improved the situation. At the seventeenth century, although carriages (6) could only go along the streets or among well-communicated towns, they were a landmark. Stagecoaches or covered wagons (9) appeared in 1700 and they began gaining importance. In 1800, light carriages (10) complemented the services provided by stagecoaches, as the last ones could not travel through narrow paths and by-roads. Engineers tried out some new technological advances (8) with no effect on the evolution of vehicles. Thus, in 1769 Josep Cugnot set up a steam boiler in a two-cylinder carriage to haul cannons (7) for the first time. However, the use of steam power to transport vehicles leant towards the railways.

Along the nineteenth century, new improvements were produced that lead to the dominating vehicle a century later. For this reason, some horse carriages incorporated steam power by 1820 (11). In 1827, Amadée Bollé issued in Le Mans the first vehicle especially built to run with steam power: "The Obedient" (12). In 1884-1885, Gottlieb Daimler patented and built a car with an internal combustion engine (13, 14). At the same time, a builder of gas engines called Karl Benz adapted one of his motors to a tricycle. Panhard and Levassor, two Frenchmen, designed and built up in 1894 what has been for a long time the basic car scheme: the engine at the front part, the gearbox at the centre with a rear wheel drive (16). From 1885, the three main force systems – the steam power (17), the electric engine with batteries (18) and the internal combustion engine with petrol (19) – evolved within their own possibilities and limitations. At the turn of the century, the internal combustion engine won the race and imposed itself. The internal combustion engine was the smallest of the three in comparison with the force transmitted; it was also very easy to start; its maintenance was very easy and the renewal of the combustible was fast and very little dangerous.

Drawings

Roman period

1. An ox-driven carriage to carry goods
2. Troops
3. Military elite troop-carrier and mail coach, at the same time

Medieval period

4. Ratchet: to highlight the innovations of the horse-collars (a) and the stirrup (b)
5. Sedan chair

From Modern period to the twentieth century

6. Carriage with leather strips' suspension
7. Josep Cugnot's vehicle (1769)
8. Watt's steam power engine
9. Public transport: covered wagons
10. Small public transport: light carriage
11. Traditional steam carriage (1832)
12. "The Obedient" (1872)
13. Application of Daimler's engine to a bicycle (1885)
14. Application of Daimler's engine to a horse carriage
15. Bonet's vehicle (1889), first vehicle in Catalonia
16. Panhard's vehicle (1895)
17. Steam vehicle (1894)
18. Electric vehicle (1898), which could go 100 km/h in a 300-m dual carriageway
19. Internal combustion engine vehicle from "La Quadra" brand (1898)

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THE EVOLUTION OF CARS

Cars have extraordinarily evolved after each of the World Wars. During wartime, the manufacturers devoted themselves to the military production (tanks, cannons, aeroplanes, ships, etc.) and later, they applied every innovation to the car industry. During the First World War, the

new vehicles proved to have easiness and swiftness. Consequently, the Parisian taxis (6) had carried troops at the zone of Marne, where took place one of the most important battles.

From the First World War onwards, a new generation of cars appeared with important technical improvements: electric lighting, battery, power-assisted brakes and new suspension systems (like those of the 32 CV-Hispano Suiza (7) and of the Duesenberg (8)). The countries that fought the Second World War needed new vehicles that could facilitate land communication. They built up vehicles for warring; afterwards, they were adapted in peacetime, like the BMW motorbike (14) or the Jeep (13), the foregoing of the nowadays all-purpose vehicle. One of the first car models where the electronic knowledge of the Second World War was applied was the Lincoln. The world of the competition was and still is the other way that cars have to evolve (16). Then, innovations appear like the rear-view mirror, the seat belt, the electronic gearbox, the disk brake or the aerodynamic stability. The winners of the motor racing and the brands bound to countries represent the current technological power.

From the seventies onwards and because of the energy crisis, people started to think about how to save petrol. Some studies taken at that time showed that streamlined shapes reduced the consumption of energy and at the same time, there was an aesthetic change displayed in all end-of-the-twentieth-century cars. Security and comfort also caused changes such as the power steering, the airbag, the ABS brakes and the air-conditioned.

Along the twentieth century, cars have become from an object for the elites to a mass-consumption product.

At the beginning of the twentieth century, one could see the birth of excellent car brands like the Rolls Royce, the Mercedes and the Hispano Suiza, with easy-to-drive models but only within reach of the elite. The first popular car was the American Ford T (4) because the factory manufactured 15 millions between 1908 and 1927. The first European popular car was the French car 5 CV-Citröen (9) and the German Volkswagen (10) – colloquially known as “The Beetle”, ten years later. The first Spanish popular car was the Seat 600 (20), manufactured at the Seat’s in Barcelona’s Zona Franca in 1955 but it got popular in the sixties. The public transport also benefitted from cars and that made easy to communicate from a new perspective. Coaches gradually substituted animal-power carriages. They could communicate with zones that were not within the railway reach. The Hispano Suiza coaches were among the most used in many firms: the Hispano-Hilariense, the Hispano Igualadina, etc.

Drawings

1. Mercedes Symplex (1901)
2. Rolls-Royce (1904)
3. Hispano Suiza (1904)
4. Ford T (1908)
5. Hispano Suiza’s public transport
6. A Renault Parisian taxi (1909)
7. 32 CV-Hispano Suiza
8. Dusenberg: a luxury American car (1926)
9. 5 CV-Citröen (1921-22)
10. Volkswagen (1934)
11. 260 D-Mercedes Benz with a diesel engine (1936)
12. Citröen 11: a monohull car (1937)
13. Jeep
14. BMW motorbike
15. Lincoln: a luxury American car (1949)
16. Alfa Romeo: a racing car
17. Biscuter: a Spanish minicar (1954)
18. Isetta: an Italian minicar manufactured under license in different countries
19. Seat 1400: Seat’s first car (1953)

20. Seat 600 (1955)
21. Mini Morris: a small car with quality and design (1959)
22. Renault 5 (1973)
23. End-of-the-twentieth-century stereotyped car

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THE INTERNAL COMBUSTION ENGINE

As far as the mechanics, cars have not much changed, yet the main elements have been in steady evolution. For example, the present-day internal combustion engine still has the same working system and the same pieces – pistons, connecting rods, crankshaft and camshaft –, which accomplish the same functions as in the first prototype. All changes have been motivated to improve the previous situation, either by different cooling systems or by different strokes (four strokes, two strokes, diesels and semi-diesels). The spark injection system has replaced the carburettor of some models. The rest of the engines propelled by petrol – rotaries, turbines, etc. – have not had an important commercial introduction.

The appearance of the internal combustion engine motivated thrusting petrol and obtaining benzine from that process. The intensive exploitation of petrol started in the United States with Colonel Drake's drillings in 1859. The economic role of petrol and the world of the means of transport (cars, in particular) have caused that some planet zones – the ones rich in oilfields – have a set importance in politics and world economy.

Section of Panhard's engine (1907)

1. Intake pipe (air and fuel)
2. Sparking plug
3. Ejection tube
4. Gas outlet
5. Camshaft
6. Propeller shaft
7. Connecting rod
8. Piston

Section of a four-stroke petrol engine

1. Air cleaner
2. Spark plug
3. Camshaft (controls the opening and the closing of the valves)
4. Inlet valve
5. Outlet valve
6. Cylinder
7. Generator
8. Pulley
9. Piston
10. Connecting rod
11. Intake pipe (air and fuel)
12. Carburettor

The working of a four-stroke engine

1. First stroke: the inlet valve opens, the fuel comes in and the suction produced when the piston descends results in air.
2. Second stroke: the closing of both valves produce air compression.
3. Third stroke: the sparking plug sparks off, the petrol goes off and the energy makes the piston go down.
4. Fourth stroke: when the piston goes up, the gases go out because the outlet valve opens.

The working of a diesel engine

1. Air comes into the inlet valve.
2. After its closure, the piston goes up and it results in air compression.
3. The heat of the air and the injection of fuel automatically make fuel turn on and spark off.
4. The blast moves up the piston and gases go to the outlet valve.

Photo

Petrol station at the “La Selva” Hotel Inn, 1950

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THE CAR MADE FOR THE PURPOSE

The manufacturers of the first cars just offered the mechanical part to their clients: the frame, the wheels, the engine, etc but with no coachwork. Later, the purchaser had to go to the specialist firms to put the bodywork.

In our country, there were different chassis’ factories. The first brand was “La Quadra”, in Barcelona. Some became famous abroad like “Hispano Suiza”, the builder of luxurious cars.

The innovations in the bodyworks’ system began at the end of the thirties, when Citröen 11 came on to the market in 1937, together with a frame and a coachwork. As a result, the former coachbuilders became designers of the best brands.

Parts of a chassis: a 1927 Hispano Suiza, model 49

1. Wheels
2. Steering wheel
3. Control panel
4. Handbrake
5. Hood
6. Headlights
7. Wire spokes
8. Engine
9. Gear lever
10. Springs’ suspension
11. Fuel tank

Drawings

- Limousine-type vehicle
- Goods' vehicle
- Racing coachwork
- Public transport
- Peculiar coachwork in the thirties

The process of bodied began with the building of a casing and the wood doors and with some metallic braces (1); then, the casing was covered with metallic sheets (2). At that time, there was the placement of the mudguards, the stirrup and the boot. The coachwork was hand-painted, varnished and polished and there was the fixation and upholstering of the seats (3). Finally, somebody put the bumpers, the lights and the wheels and the hood was assembled (4). Skilled labourers like carpenters specialized in coachworks or former boilermakers that had become panel-beaters realized the different processes of bodying. These days, the only bodied vehicles are the industrial ones – coaches and lorries- and the racing cars.

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MASS PRODUCTION

From the beginning of mass production until now (i.e. the whole of the twentieth century), the process has changed a lot. The car industry is nowadays one of the industrial sectors where there have been applied more technological innovations and where the production processes are more sophisticated. Factories are important industrial complexes, which generate an important economic dynamism around them and at the same time, they produce for the international market.

In 1907, Ford applied the tooling system for coachworks to his car building and from then on, it started the mass production of his vehicles. In 1908, the first Ford T units were in the market. It was the first mass-produced car with tooled pieces: bumpers, stirrups, doors, etc.

Photos

- Ford factory. Chassis' assembly line
- Ford factory. Coachworks
- Ford factory. Assembly line
- The first big factory in Spain was Seat's in Barcelona's Zona Franca, which produced its first car in 1953
- SEAT factory in Zona Franca (Barcelona) showing the end of the engine's assembly line
- Robotic arms welding

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FROM THE DRUGSTORE TO THE SERVICE STATION

The use of cars, either private or public, involved the appearance of a series of new services. In the beginning, many shops like drugstores sold petrol, the easy-to-carry energy. Later, when

cars imposed themselves, the necessity to fill up with petrol and the frequent breakdowns made the service stations appear. There, users could buy petrol and repair breakdowns.

From 1920, the internal combustion engine dominated the whole market. Consequently, repair shops started to proliferate. One could distinguish them because they could repair everything, with no specific distinction. For example, they mended or changed tyres when necessary. Balloon tyres were used almost from the invention of cars (in the beginning, solid tyres and later, tube tyres). In 1885, André Michelin manufactured the first type of tyres, which were one of the greatest technical changes in favour of cars. Their use was essential to lessen the bad conditions of the roads, giving at the same time more agility and more easiness of bearing. The first inner tube tyres were called 'heeled' and the tubes were inside the rims. Tyres developed and in 1948, the Michelin firm brought out the radial ply tyres. Tyres' manufacturers like Michelin (1880) and Dunlop (1889) established factories and branches just as the multinationals belonging to the car industry or to the petrol industry.

Photo

Bonet's car filling up with petrol in a drugstore

Drawing

Ideal drawing of Salvador Claret i Naspleda's service station

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THE SPECIALISATION OF SERVICES

The complexity of cars has led to a specialisation of services, dividing the fuel supply (linked to the big oil companies) from the specialised garages.

The electric part of the car is nowadays is of extreme importance. The first application of electricity in cars was in the USA in 1915. Technically, the second big advance – the first one was the internal combustion engine – was the use of a small battery that makes easy the use of vehicles and makes them more comfortable: it was not necessary to start with a starting handle nor to light the gas of the headlights nor to press the horn manually. The new electric headlight improved the driving. Firstly, the headlights were of oil and they only could show the situation.

With the introduction of the generators of carbide gases or with bottles of acetylene and thanks to the magnifying glasses, there was an important improvement yet the electric battery was the final finding to change lighting.

The manufacturers took into account that the changes were mainly directed towards the users: for their comfort, simplicity of usefulness and later, for their safety during the thirties.

In recent years, many of the technological changes in cars have been the result of the experimentation within the motor racing world. Therefore, this situation revealed a more specialisation in services.

This specialisation has allowed the appearance of some careers linked to cars, such as the panel beaters, the mechanics, the electric specialists, etc. and they have given rise to an important industry connected to the automobile.

Garages devoted to the maintenance of engines; garages devoted to the electric part; workshops devoted to the coachworks, mainly to the metallic sheets and paints; to the upholstering... are some of the economic activities that cars generate. Shops devoted to the car accessories are also important: radiocassettes, mats, all types of adornments, etc. There are also big places – mainly, the car brands' workshops – that offer all the above services.

Finally, there are also garages, either public or private, which already form part of the present-day urban landscape.

Photos

Workshop devoted to tyres
Garage devoted to tyres
Garage devoted to sheets and paints
Electric workshop
Garage
Self-service car wash
Exhaust pipes' workshop
Maintenance garage

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SALVADOR CLARET NASPLEDA, A COLLECTOR'S PIONEER

Salvador Claret i Naspleda (1909-1984), the founder of Salvador Claret's Car Collection, was one of the first Spanish protectors in favour of the preservation of technical heritage and more exactly, of car heritage.

His hobby led him to buy a 1923 Ford T model in 1950 that he restored. During the sixties, he took part in a classic cars' race with this same vehicle. His success in this race encouraged him to start the collection and he sold his Ford T to purchase other vehicles. He very soon bought a Hispano Suiza, a Rolls Royce, a Salmson and a Fiat. His interest in cars made him participate in many different activities, all connected to that world. He did motor racing for more than twenty years and opened the first driving school in Girona. In 1948, he had it built the first cheap hotel in the province of Girona – with the essential resources like a garage, restaurants, towing vehicles, a petrol station, etc. – in the service of the incipient automobile tourism. His enterprise was risky but he foreshadowed the future and bet on cars. Just think in the situation of Spain at the end of the forties and during the fifties.

His hobby made him an expert about the topic, so he took part in data retrieval works and did research works on automobile materials. At the same time, he collaborated in the publication of the book "The History of Cars in Spain" with Joaquim Ciuró i Gabarró, a historian.

At his death, the family-type collection received a very important impulse towards its preservation and exhibition. The exhibition premises have been able to be built by selling classic cars, fact that it has allowed having them on show in order to be visited.

The Salvador Claret's Car Collection is one of the first museums to collaborate with the Catalonia's National Museum of Science and Technology.

Photos

Salvador Claret (1909-1984)
Salvador Claret taking part in a motor racing trial
"La Selva" Hotel Inn

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CARS, THE MOTOR OF SOCIAL CHANGE

Cars have been and still are the road vehicles that have had more impact on society and on the economy of the most developed countries along the twentieth century. They have evolved from being vehicles just for the elite to being a mass consumption product, with a very important economic and technological weight. Their massive use has involved alterations in human relationships, new communications' network that have changed the landscape, the use of new combustibles, new graphic and symbolic languages and powerful multinational companies with sophisticated working systems (from the use of robots to the advertising campaigns of new models), which are usually top industries among the industrial sector.

Picture

Cars are nowadays a key piece within the means of transport.

Poster

A poster about a car race at the beginning of the twentieth century.

Activities (page 17)

Page 2

1. There are some early key cars at the museum. One is a copy of the model that Mr Bonnet built in 1890 with an engine bought in a Parisian exhibition. Another one is a model with a rejected motive power. What is this vehicle?

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2. Compare coachworks from different periods and try to find out the differences.

3. The Hispano Suiza brand was very important at the beginning of the last century. Investigate about the origin, its types of vehicles and the corporate names of the companies that still carry the corporate name "Hispano" within.

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4. Surely, you have private photographs from the first cars of your family. Compare them with the present-day ones and tell their similarities and their differences.

5. Crude oil is the product that modified moves the internal combustion engines. Place in a map the countries that produce more crude oil and look into the processes that take place from the source until it becomes petrol or diesel oil.

6. Despite the fact that the main communications' network has remote origins, the present-day one is very different from one hundred years ago. Look into a historical atlas of Catalonia for the roman communications' network. Then, compare it with a present-day road map. What do they have in common? Why do you think about the similarities?