



History of the Development of Parking on the Territories of Public and Residential Buildings

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Abstract— The problem of storing cars in heavily congested urban areas requires study and improvement. A large number of cars negatively affect local areas and areas of public buildings and structures. Therefore, today the topic of parking is very relevant in Uzbekistan. The concept of parking and the history of its development are given. The article reveals the problem of lack of parking spaces. Separately, the issue of the availability of organized parking spaces for all growing cities is considered. A brief review of foreign and domestic experience in creating compact and economical underground and above-ground parking lots, interception parking and other forms of storage and maintenance of vehicles has been carried out. All materials studied are aimed at improving the quality of parking and preserving and maintaining the environmental situation in the region.

Keywords: car, city, history, parking, promising types of parking, parking, underground and surface parking.

INTRODUCTION

In the development of areas of public and residential buildings, there is a sharp problem in the placement of parking lots for vehicles of the population. In solving this problem, attention should be paid to the history of the development of parking lots, from open one-level parking spaces to the creation of parking spaces in areas of public and residential buildings [1].

Thousands of years ago, there was a need for a special place for storing vehicles. The simplest example of an old parking lot is an open space where riders can tie their full-fledged horses to a pile that the horse ties. Over time, carts with light umbrellas and walking on their own appeared, requiring more space to store them. Stables and horse yards also appeared as medieval garages and parking lots[2].

Since the end of the XIX century, cars began to quickly fill the streets of large cities. At first, they simply stopped by keeping it across the street. But the growing population of the cities and the chaos of the car caused special places in temporary parking lots to be required to store the car for the rest of the day [3]. Initially, the problem was solved with the help of empty stables, but compared to horse carriages, the car was much more

comfortable and more urban residents were able to buy a vehicle, so soon there was not enough space in the stable [4]. The stables, on the other hand, were not placed in a place that would appeal to autobahns in general [2]. Parking began to appear in different parts of the world, and the decision to make them multi-storey naturally justified itself [5].

Methods.

The methodology for the article focuses on a comprehensive review of the development of parking solutions in urban areas, employing a historical and comparative approach[6]. The study examines the evolution of parking from its rudimentary beginnings to contemporary practices, emphasizing the need to accommodate increasing numbers of vehicles in growing cities[7]. Data collection includes a survey of existing literature on parking developments, ranging from open-air parking to automated and underground facilities[8]. An analysis of various types of parking solutions, such as multi-level, automated, and eco-friendly designs, is carried out to identify the best practices from both international and domestic perspectives[9]. This methodological approach integrates historical analysis with a review of case studies from different regions, allowing for a contextual understanding of how parking infrastructure has been shaped by technological advancements and urban planning needs over time. Additionally, the research identifies key factors contributing to the successful integration of parking solutions in dense urban environments, such as space optimization, cost-efficiency, and environmental considerations[10]. The findings aim to provide insights and recommendations for future parking infrastructure development, especially in the context of urban areas in Uzbekistan. By synthesizing data from various sources and examining specific examples, the study offers a framework for improving parking infrastructure to meet the needs of rapidly urbanizing cities while maintaining environmental sustainability[11].

Analyzes.

With the development of automobile transport in the first half of the 20th century, the first traffic jams and car traffic jams began to form on the streets of us and European cities. Along with this problem, the parking problem also appeared. At that time, the streets were very narrow and there was no permission for most car traffic. Thousands of black "Phaeton" (a type of light car with a top opening) began to settle irregularly along the streets, preventing other cars from passing [12].

Therefore, at the beginning of the 20th century, car parks began to appear, built specifically for cars: open, multi-level, underground, etc [13]. (Fig.1)

The first popular multi-level car park opened in central London in may 1901. The "City & Suburban Electric Carriage Company", a manufacturer of electric vehicles, built a seven-story parking garage with 100 seats. It is probably the first multi-level indoor stop in history. The cars were transported to the required floor by electric lift, then took up space under their own power. The parking lot received a certain demand, so the following year the same company built its new building for a 230-seat car, and later for a 200-seat car. The company building survives to this day [14].

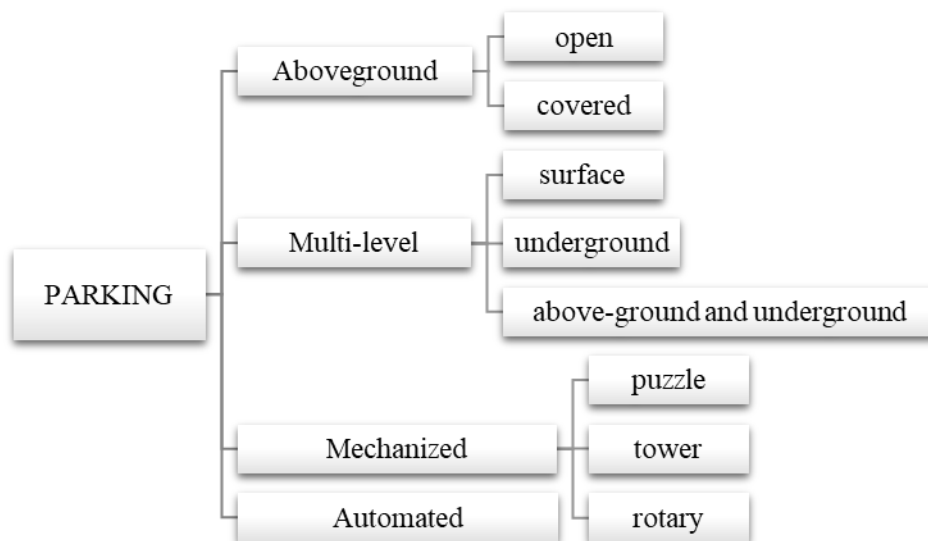


Fig. 1. Types of parking

The first example of an automated multi-storey car park was the garage of Ogyusta Perre in Paris in 1905, which dealt with the problem of long-term storage of vehicles [15]. (Fig.2) In 1907, the first automated parking lot, designed by the famous architect, was built, and it remained in operation until 1970. The difference between a simple multi-level parking from an automated parking lot is that the car is moved directly to the parking lot by a special elevator, that is, cars do not move independently along the passages on the floors. They are usually built in areas that are very rigid with a horizontal area. In the West, such types of parking are considered optimal because they significantly save space to be used, parking inside the parking lot does not start or move, a complex ventilation system is not required, and maintenance personnel are also less required [16]. The cars are carried upwards by means of a large loader. But workers would manually push the car directly into the parking lot [17].

Yekaterinburg was no exception in this matter. In 1905, free car parking appeared on the Square in the city center. At the intersection of the main streets of the central square of the city with a population of one and a half million (Lenin Royal Street and March 8th Streets) is a parking lot for 250 cars. During scientific research, paid parking lots were subsequently organized on the following streets: March 8, Popova, Khokhryakova, as well as parking lots on the central square of 1905 were also excluded (including parking lots on Uritsky and Volodarsky streets). The only free parking on Bankovsky narrow street in the area also remained in place, without changes, along with the territory [18].

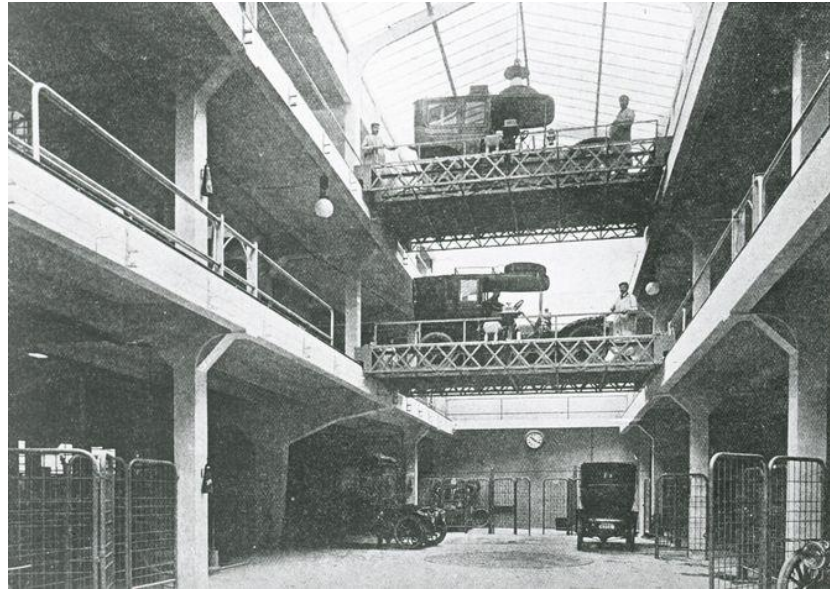


Fig. 2. Partially automated parking, Paris 1905

Source: <https://www.smartparking.org.ua/ru/robotizirovannye-parkingi-istorija-princip-raboty-i-preimushhestva/>

The first underground parking lot appeared under the Mila house in Barcelona in 1910. The architect of the house was the talented Antoni Gaudí, and the house itself is included in the UNESCO World Heritage List. The first two-level underground parking garage appeared in 1964 under the California State University buildings, and the largest 2,400 auto-seated underground parking facility is now located in Toronto [19].

The problem with parking affected the United States too late, perhaps because cities were built completely differently than in Europe and had enough space for everyone for a long time, but in the mid-1910s Chicago faced the problem of parking cars of residents of the La Salle hotel. There was simply no free space on the street, so in 1918 a multi-level parking was built from the entrance to the hotel directly from the hotel. By the way, the first American parking lot existed until 2005 and served 29 years longer than the hotel itself[20].

Later, this problem developed most dramatically in American cities such as New York, Chicago, Cincinnati, and Detroit in the early 1920s, and it is not surprising that mechanical parking was built there for the first time. The first and simplest type of parking was open-deck parking. Such types of parking are maintained to this day and are one of the most common parking lots [21].

The increase in real estate prices on Manhattan Island and the inability to accommodate typical parking lots and parking lots due to the lack of space between huge skyscrapers forced property owners to seek help from engineers. It is difficult to say who invented the parking elevator for parking lots and buildings for the first time. It has been kept in the same form unchanged since the first World War. In 1925, the American engineer and inventor Max Miller invented and patented the first mechanical parking system in the United States, or rather, the first automobile elevator, an example of a modern system. But for several reasons, records of the use of his invention in history have not been preserved. The first patent for a system called "chertovo koleso" ("devil's wheel") for cars was registered by Westinghouse Corporation in 1923, similar to the devil's, Satanic wheel [22].

"Kent Automatic Garages" purchased a 1,200 m² parcel of land on a busy street corner in 1928, and construction began on a 25-story automated parking garage for 1,000 cars [23]. In May 1929, New York City had a multi-level parking lot for 1,000 cars, where a passenger had to enter the parking lot only in the elevator, press a button, after which the system would install the car in the right place without human intervention [24]. The

difference between parking is that the cars were moved from the entrance to the elevator and along the floors through a special connecting device that moves to the parking floor [25].

Since the second half of the 1930s, many buildings have been equipped with mechanized vehicle storage systems. Such systems were especially popular in prestigious residential buildings and large office centers. An example of such a building is the parking lot at 43 West 61 Street in Manhattan, New York. The building was built in 1930 in the Art Deco style, fully equipped with automatic lifting mechanisms, and was known as the “Kent Automatic Parking Garage Building” at the time of its creation. Since then, the evolution of automated car parks has begun, which have changed, improved and complicated every year [26]. The company existed until the 60s, when the capacity of parking lots was doubled due to the fact that American cars were so large [27].

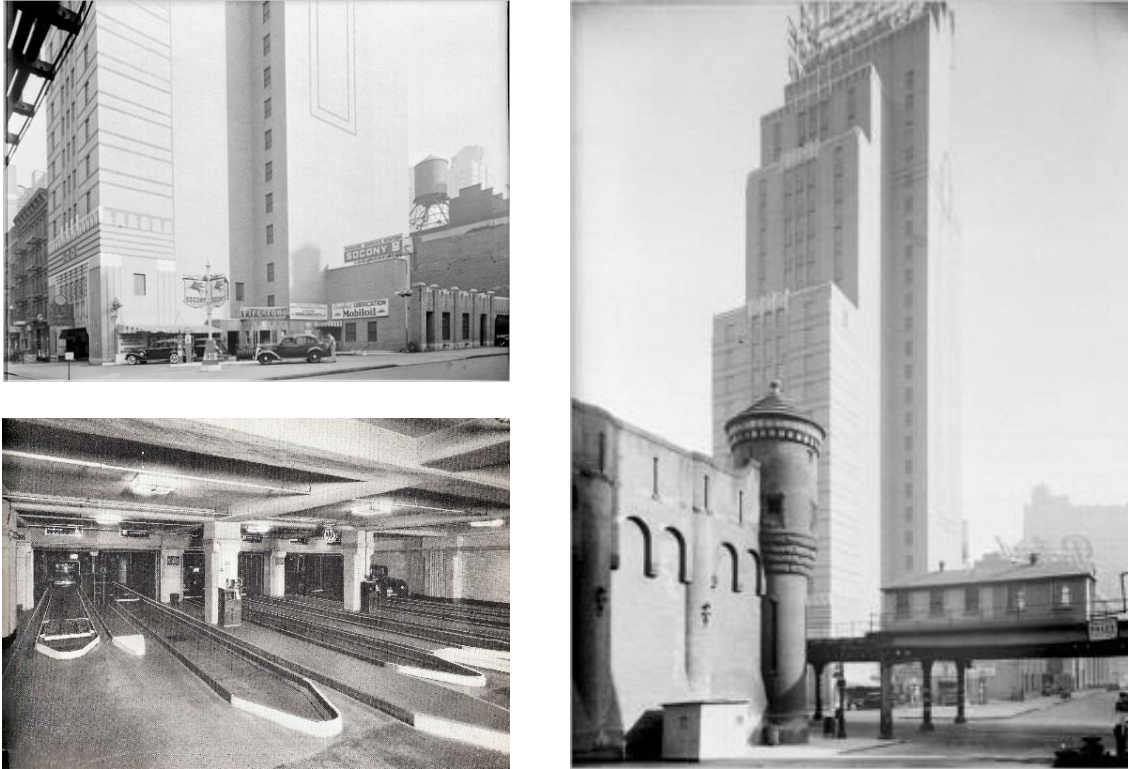


Fig.3. Kent Automatic Parking Garage Building

<https://senrus.livejournal.com/809.html>

The first mechanized parking was carried out in 1932 on Monroe Street in Chicago. A parking lot with a rotor (rotor – a rotating part of cars) is located on one of the central streets of the city and looked unusual for those times [8]. This parking lot was built for an international exhibition that was supposed to be in Chicago. The motto of this international exhibition is called “the age of development”, and since this period, car parks of such appearance have become popular all over the world. [28]



Fig.4. The very first mechanized parking in the world

<https://www.gksorex.com/single-post/2017/12/>

At this time, in the early 1930s, with the unification of multi-level parking lots in the construction industry, a trend appeared to design residential buildings. In them, cars are placed on the stairs and carried out using ramps, elevators or loaders to climb to the desired floor. Such parking lots are divided into two types by the length of storage of the car: for short-term and for long-term stay. In parking lots, which are combined into residential buildings, long-term car storage areas are used. Fire safety measures have been implemented for this type of parking [1].

Since the second half of the thirties, many buildings have been equipped with car storage systems. Progress did not stop, and in 1955, Charles A., who was granted a patent for a container sorting mechanism. Bertel changed the purpose of his mechanism. But several unsuccessful experiments with such a system put an end to Bertel's development. However, the idea of containers survived and was implemented at the next stage of the development of machine technologies [10].

The first equipped paid parking lots appeared in the United States in 1935. These are municipal (Municipal - Housing, Local Self-governing body of the state of land and property) parking lots, each place is equipped with a "parquet"-parking meter. Such devices are a counter with a clock mechanism, indicating the time until the end of the paid parking of the vehicle. When using such equipment, the driver of the car had to pay the parking fee and turn on the parquet.



Fig.5. The first parking meters for paid parking

<https://3390017.ru/organizaciya-parkovki/istoriya-razvitiya-parkovok/>

Depending on the type of device, it is automatically turned on when depositing funds or using a rotating handle that surrounds the mechanism. After that, the countdown of the paid period in the parking lot began. Later, in 1958, such types of parking appeared for the first time in Europe (Great Britain, London) [11]. Today, the method of payment for parking using special equipment (a smartphone or bank card is used) is implemented through the classic currency system to activate it [29].

In the 1940s and 1950s, more and more APS (automated parking systems) were built in the United States, some of which are still in use today, such as Bowser, Pigeon Hole, and Roto Park. In 1951, the world's first driverless parking lot was built in Washington. 1961 Auto stackers (automatic harvesters) were installed in parking lots in Woolidge, London, UK, and at the time it was still very difficult to operate.

The first fully automatic car parks appeared in Washington in 1951. There, human participation was not required at all, and from the moment of getting out of the car to the parking lot, only 15 seconds pass, the same time as the delivery of the car is allocated [3].



Fig.5. The 40-50s of the XX century. A new round in the history of automatic parking

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Discussions .

In the 40s and 60s of the 20th century, with the increase in privately owned vehicles and the increase in land prices, the need arose to build compact and comfortable parking lots.

Since the early 1960s, the idea of compact automated car parks has become increasingly popular in Japan and Europe. The Japanese economic miracle reached its peak. West Germany recovered from the effects of World War II – economic growth led to an increase in the number of cars. In the mid-60s, Bob Lichy developed a rotor (Rotary) parking lot with a capacity of 22 cars.

Systems created in the 60s and 70s of the 20th century went through the evolution of production technologies and were adapted to the needs of the 21st century. Having gone through a long development path of almost a century and gone through many changes, and in our time, parking lots are complex architectural structures that combine innovative vehicle maintenance technologies with the latest constructive solutions in the field of construction. Modern solutions and developments in the field of modular parking are focusing more on multi-level parking, which in many ways are better and more convenient than their predecessors [30].

Electromagnetic sensors in the parking lot (sensor – receiver and transmitter device) are a device that warns of the danger of parking. They were re-invented in the 1970s without spreading from previously developed technologies.

By the middle of the 90s of the last century, paid parking began to spread in Russia using specialized equipment for parking lots. Not only municipal, but also private car parks are developed. In the 1990s, experts noted a rapid increase in demand for robotic parking.

In these years, the US interest in automated parking systems (APS) decreased slightly, while the technically advanced APS is emerging in Europe, Asia and Central America. In the late 90s, Japan even became a leader in the world of manufacturers of automated parking systems with more than 100,000 automated parking spaces per year.

In early 2000, the technology of parking smart sensors began to work in shopping centers. The first robotic parking lot was built in Hoboken, New Jersey in 2002. At the same time, scientific research for the first time mentions the use of GPS for smart parking lots.

Conclusions.

The study underscores the critical evolution of parking solutions in urban environments, revealing a historical trajectory from simple open spaces to complex multi-level and automated parking systems. The findings highlight that technological advancements, coupled with increasing urbanization and vehicle ownership, have driven the development of more efficient and space-saving parking solutions, such as underground garages and automated systems, which are particularly significant in densely populated cities. These advancements imply a need for urban planners and policymakers to prioritize innovative parking solutions that balance the demand for vehicle storage with environmental sustainability and urban space optimization. Further research should explore the integration of smart technologies and eco-friendly materials in parking design, as well as the socioeconomic impacts of adopting advanced parking solutions in developing regions like Uzbekistan. Additionally, studies could investigate user behavior and preferences to enhance the functionality and accessibility of future parking infrastructure.

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