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HISTORICAL TECHNICAL EQUIPMENT OF RESIDENTIAL AND PUBLIC BUILDINGS. ELECTRIC PASSENGER ELEVATORS ON THE POLISH TERRITORY FROM THE 19th TO THE HALF OF THE 20th CENTURY

Passenger elevators (lifts) have become an indispensable part of building equipment in modern construction. Recognizing the gap in knowledge about the history of the development of lifting devices in Polish territory at the turn of the 19th and 20th centuries, the author undertook a scientific research project. The study involved three main stages: archival queries, inventory trips across Poland to prepare a catalog, and analysis of the information gathered. This article is a project results summary and an attempt to answer some fundamental questions about the development of vertical transportation in the Polish construction industry.

Keywords: passenger elevator, historical elevators, technical heritage, elevators history, lifts history, technical equipment, technical supervision

1. INTRODUCTION

Historical electric passenger elevators are a particular group of technical heritage we all have the opportunity to interact with daily. They are technical equipment for urban construction, whether office, commercial, hotel, or residential. As a machine for vertically transporting people, they have become an integral part of multi-story buildings. Being material products of human activity, they are a source of knowledge about the broader social culture, helping to understand the ideas and motivations of the particular community to which their creators belong [Barański 2007: 21-23]. They document the level of technical culture, knowledge at the time of their creation, and the needs they satisfied, both individual and collective. Their preservation and recognition play an essential role in forming social, ideological, and artistic consciousness and maintaining the continuity of cultural development, including technical culture.

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Recognizing the gap in the state of knowledge about the history of the development of lifting devices in Poland, the author undertook research as part of the implementation of a scientific research project entitled: "Development of lifting devices on the Polish territory from 19th to the half of the 20th century" (Nr UMO-2019/33/N/HS3/01662). This research aimed to identify as accurately as possible the presently preserved lifting devices in the Polish lands at the turn of the 19th and 20th centuries. Due to the extensiveness of the topic and the lack of previous scientific studies devoted to this issue, the study group of devices was limited to passenger and passenger-freight electric elevators. The time frame adopted for the research is 1880-1945. The starting date tied to the presentation of the first lifting platform dedicated to vertically transporting people, equipped with an electric drive, during the Mannheim exhibition. On the other hand, the end of World War II and the beginning of the country's reconstruction after war damage is the closing caesura for the period under study. According to Władysław Prusakowski and Tadeusz Todtleben, for repairing existing elevators after 1945, old parts often pulled from the rubble were used, rebuilt, and completed [Prusakowski, Todtleben 2011: 26-28]. The nationalization of the elevator manufacturing factories after 1949 marks the beginning of another chapter in the history of the Polish elevator industry.

The research involved three main stages: archival queries, inventory trips across Poland with the preparation of a catalog, and analysis of the information gathered. This article summarizes the results obtained in the course of this project.

2. LITERATURE AND ARCHIVAL SOURCES ANALYSIS

Analysis of the available literature has shown that the history of the development of the construction of lifting devices in Poland is still an issue that is not explored. Bolesław Orłowski's publications about the history of common and Polish technology do not include issues concerning the elevator industry [Orłowski 1963; Orłowski 2008; Orłowski 2010]. This issue is also not addressed in other books popularizing the history of technology [e.g. Kopczyński 2009; Michalik, Kisilowski (eds.) 1992], while in textbooks and thematic encyclopedias, there are only short references [Troskoleński (ed.) 1973; Raabe 1939; Kwaśniewski 2004].

The only attempt to comprehensively capture the history of elevator development in Poland from the beginning of the 20th century to the 1990s was a 50-pages popular science book written by Władysław Prusakowski and Tadeusz Todtleben [Prusakowski, Todtleben 2011]. The beginnings of Polish technical supervision were approximated in an album jubilee publication entitled *100 lat polskiego dozoru technicznego 1911-2011* [Piasecki, Stefanowicz (eds.) 2011]. These publications were a starting point for further research. However, the information they contained required verification due to the lack of indication of sources.

Better recognized, however, is the history of the development of the elevator industry in the United States, Germany, France and Austria. It is a valuable comparative material. The first studies about this topic were published by such industrial companies as the American Otis company and the German Maschinenfabrik Carl Flohr. These publications were meant to prove the long-standing tradition and extraordinary role of these manufacturers in the history of the elevator industry, as Andreas Bernard wrote more extensively about in his book [Bernard 2014: 5-10]. The author has presented the history of passenger lifts in the United States and Europe (here, especially in Germany, Austria and France). In his considerations, he analyzes how their invention influenced changes in the formation of architecture and urban planning of cities and how the public perception of this invention changed. Lee E. Grey took a different approach in his book [Gray 2002], presenting the history of the development of passenger elevators through the evolution of their design. These publications provide an essential point of reference for considering Poland's elevator industry development.

Archival searches were carried out at branches of the State Archives in Gdynia, Lodz, Katowice, Cracow, Poznan, Warsaw, and Wroclaw. The author searched for documents related to the activities of the Prussian *Dampfkessel-Überwachungs-Vereins*, Polish Boiler Inspection Association and documentation on passenger elevators. These were correspondence, printed annual reports, and statutes forming residual archival assemblages that do not comprehensively represent the activities of these associations. During this research, the complete list of elevators registered in the city was found only in the Cracow National Archives collection. In Poznań, the residual inventories of elevators survived, but they do not fully present the stock of equipment under supervision.

In addition to archival sources from state archives, digitized technical journals published up to 1945 from the collections of Polish and international digital libraries were used to write this article. Information was obtained from archived issues of the German-language magazines "Elektrotechnische Zeitschrift" and "Deutsche Bauzeitung" from the collections of the Internet Archive. Materials found in selected issues of the weekly magazine devoted to issues of technology and industry "Przeгляд Techniczny" from the collections of the Digital Library of the Warsaw University of Technology and the Jagiellonian Digital Library were processed. In addition, information was used from articles and advertising materials of selected issues of the monthly magazine "Architektura i Budownictwo" and "Architekt. Miesięcznik poświęcony Architekturze, Budownictwu i Przemysłowi Art." from the collection of the Digital Library of the Warsaw University of Technology.

3. THE ORIGINS OF ELECTRIC PASSENGER ELEVATORS IN THE UNITED STATES AND EUROPE

While in the United States, passenger lifts became standard equipment in multi-family residential buildings at the furthest in the 1880s, they were a rarity in Europe until the 1870s. Interest in this means of transportation only increased when an electric motor replaced the hydraulic drive. Werner von Siemens was the first to propose this solution when Siemens & Halske presented a man lift powered by an electric motor at an exhibition in Mannheim in 1880 [von Siemens 1880]. Europe's first electric passenger elevator with modern rope drive, built by Siemens-Halske and Freissler, opened in early August 1890 in Salzburg [Payer 2017].

A more efficient alternative to the enclosed multi-person internally controlled cabin lift was the cyclic elevator (the so-called "paternoster"¹). The prototype of this device was designed in 1866 by architect and civil engineer Peter Ellis and patented by him a year later (U.K. Patent No. 1845, granted January 5, 1867) [Gray 2014a]. The device was installed in the Oriel Chambers building in Liverpool in 1869. According to Lee Gray, Ellis was one of the first to propose using elevators in office buildings [Gray 2014b]. Previously, the technology had been limited to hotels and industrial and commercial buildings. Subsequently, English engineer Frederick Hart undertook work on improving the paternoster design. In 1878 he obtained a patent for improving the operation of the circular elevator (U.K. Patent No. 81, Improvements in Elevators, granted July 5, 1878) [Gray 2012]. According to Hart's patent, production of equipment began by J & E Hall of Dartford, England, under the name Hart's Cyclic Elevator. Paternoster-type elevators were famous in the first half of the 20th century because they could carry more passengers than regular elevators. They were more common in continental Europe than in Britain, especially in public buildings [Bottomley 2014]. Germany's first paternoster passenger elevator was built in 1886 by the English company Waygood & Cie. for Hamburg's famous Dovenhof office building. As early as 1887, the German company Wimmel & Landgraf of Hamburg began producing lifting devices of this type, and in 1896 the well-known elevators company Carl Flohr of Berlin also expanded production to include a paternoster system [APP sygn. 4360].

¹ The name paternoster comes from the first two words of the Lord's Prayer in Latin ("Our Father") and was originally applied to the device because the paternoster elevator cars move in a loop and are thus similar to the rosary beads used to help recite the prayer.

4. BEGININGS OF THE USE OF ELECTRIC PASSENGER ELEVATORS IN THE POLISH TERRITORY

The beginnings of the use of electric passenger lifts and, more broadly, the development of the elevator industry in Poland date back to the partition period, the First World War, and then the interwar period. On the one hand, it resulted in a strong influence of the partitioning powers (especially the selection of German or Austrian companies producing devices). On the other hand, it was a period of changes in thinking about the development of technology caused by the industrial revolution. An engineering career has ceased to be a kind of extravagance, becoming something within the norm [Orłowski 2008: 106-123]. Archival and literature research had not answered when the first electric passenger elevator was installed on the Polish territory. However, based on the information collected, it can be said with certainty that these devices were used within the borders of present-day Poland in the late 1890s. An electrically driven passenger lift manufactured by the German company Carl Flohr (Berlin) was installed in the former Landeshaus der Provinz Silesia in Breslau in 1897 (Fig. 1).



Fig. 1. Electric passenger elevator in former Landeshaus der Provinz Silesia in Breslau (now the headquarters of the Supreme Technical Organization) from 1897, manufactured by Carl Flohr Berlin company (photo by K. Pietrzak)

The same company equipped the building of the “Rossya” Insurance Company in Warsaw, completed in 1899, with electric elevators [„Architekt” 1901: 101-104]. This fact was noted in an architectural and construction magazine so briefly that it can be assumed that these devices were well known in the community and were no longer a novelty to readers. The record of active elevators taken around 1900 for Poznań shows that at least one passenger elevator in a residential building (Breitestrasse 15, today’s Wielka Street) was permitted in 1899, and three more in 1900, including two passenger elevators at the Bazar Hotel [APP sygn. 4360]. With the latter, it was clearly noted that they were electric lifts.

Because of the ever-increasing number of devices, the decision was made to introduce technical supervision for these devices to ensure their safe operation. In 1903-1908, control for electric elevators in the German Empire (former Kingdom of Prussia) was entrusted to the association of engineers, the *Dampfkessel-Überwachungs-Vereins* (the Association for the Supervision of Boilers) [APP sygn. 9373]. The registration and supervision of Kraków’s elevators were handled, according to a 1916 Magistrate’s decree, by the Installation and Mechanical Branch of the Building Department of the Magistrate of the City of Cracow (during the partition period in the Austro-Hungarian Empire) [ANK sygn. Kr 7519]. In Warsaw (during the partition period in the province of the Russian Empire), the Boiler Supervision Association, which also had electrical installations as part of its scope of activity, had been operating since January 7, 1911 [Piasecki, Stefanowicz (eds.) 2011].

5. OCCURRENCE OF ELECTRIC PASSENGER ELEVATORS IN THE CONTEXT OF PARTITIONED TERRITORIES

The archival materials collected did not make it possible to determine precisely how the number of installed and operational passenger lifts in the Polish lands changed in subsequent years. A valuable source of information in this regard are the reports of the *Dampfkessel-Überwachungs-Verein* for the years 1908-1915 [APP sygn. 9373; APP sygn. 5518; APP sygn. 477; APB sygn. 8345]. Those materials show that in the Province of Poznań alone, the number of elevators requiring inspection increased from 281 to 480 devices during those years. The Installation and Mechanical Branch of the Building Department of the Magistrate of the City of Cracow registered 459 devices in Cracow alone between 1917 and 1943 [ANK sygn. MZB 5]. The oldest electric passenger lifts listed there date from 1908-1910. Information on the number of installed devices is also a marketing element for elevator companies. When sending the investor an offer with a cost estimate for the construction of a lift, sometimes include an illustrated catalog and a list of completed investments. The Carl Flohr company from Berlin installed 427 elevators in Warsaw and Łódź between 1912 and 1927 [APŁ sygn. 1757]. The author's research showed that to this day, interwar period equipment

from this manufacturer survives not only in Łódź and Warsaw, but also in Poznań, Opole, Katowice and Wrocław. The Vienna-based Wertheim company, in a similar list sent in 1927 to Łódź Electrical Society S.A., lists 284 devices in Cracow, Lviv, Łódź and Warsaw, among others. Inventories conducted during the research revealed a significant number of surviving passenger elevators manufactured by four manufacturers based in Vienna. Wertheim and Stefan Sowitsch were the two leading companies, and the somewhat less popular A. Freissler and Hans Füglistner (equipment preserved primarily in Cracow, Katowice, Łódź and Cieszyn). The Italian company "Stiegler", the Breslau-based Maschinenfabrik J. Schammel Breslau (preserved equipment in Poznań and Bytom), C. Herrm, Findeisen Chemnitz-Gablenz (Poznań and Olaszyn), and Hirschberger Maschinenfabrik F. und A. Theuser (device in Moszna Castle) also had their representative offices and completed investments on Polish territory. Among the preserved equipment from the interwar period appear the devices of the first Polish elevator company "ROMAN GRONIEWSKI SPÓŁKA AKCYJNA Jedyna Specjalna Fabryka Dźwigów w Polsce, Warsaw" (ROMAN GRONIEWSKI joint-stock company, The Only Special Elevator Factory in Poland, Warsaw). Besides, machines produced by manufacturers such as Otis and the Carl Flohr mentioned above, Stefan Sowitsch, Wertheim, and J. Schammel continued to be installed.

Based on the questionnaire, archival, and literature research mentioned in the introduction, a map of the occurrence of passenger and passenger-freight electric-driven elevators in Poland from 1880-1945 was prepared. Then the approximate course of the partition borders within the modern territory of the country was plotted on the map of Poland prepared in this way (Fig. 2).

The cited list shows that a considerable number of passenger and passenger-freight electric lifts (according to the current state of knowledge) were installed in the territory of the former Prussian partition (146 devices). On the territory of the former Russian partition, 96 devices are known, and on the territory of the Austrian partition – 85. These figures take into account devices whose addresses are known and verifiable locally. The statistics cited from archival documents suggest a much higher number of devices installed by elevator companies and under supervision. However, they do not allow a clear indication of a particular device's location or address. Therefore, the numbers and distribution shown on the map (Fig. 2) cannot be considered the final number of elevators installed between 1880 and 1945. Instead, they should be continuously updated, along with further processing of archival materials and information obtained during inventory trips, even after the completion of the research financed by the NCN research grant.

Based on the data taken, however, some regularities in the territorial distribution of devices can be noted. On the territory of the former Prussia and Prussian partition in larger cities such as Bydgoszcz, Gdynia, Katowice, Poznań, or Wrocław, the number of recorded historical elevators ranges from 10 to 34 devices. More than 40 objects are single devices installed in smaller towns. In the case of the former Russian partition, electric lifts were installed primarily in large cities: Warsaw and Łódź. In addition,

single facilities in Kalisz and Lublin. In the former Austrian annexation area, the situation is similar, with most of the devices installed in Krakow, while single ones in Bielsko-Biala, Istebna, Krynica-Zdrój, and Przemyśl.

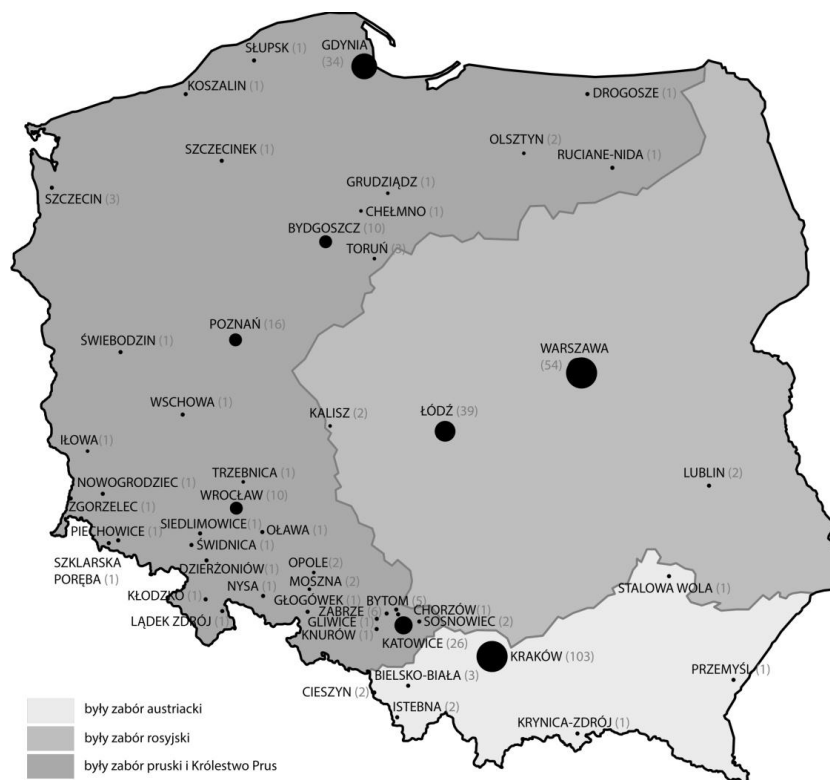


Fig. 2. The occurrence of electric passenger and passenger-freight elevators in Poland (within the modern territory of the country) from 1880-1945, taking into account the course of the partition borders. Based on data obtained from questionnaire surveys, archival and literature searches (by K. Pietrzak)

At this research stage, no unequivocal conclusions can still be drawn. The proportion of well-known preserved historical lifting devices in smaller and larger cities may be due to the different degrees of recognition of the state of preservation by the offices. We cannot exclude the possibility that there are numerous preserved devices about which the author and the offices approached with the questionnaire survey do not have information at this stage.

However, having the data obtained from archival records – lists of devices installed by individual companies and “records of lifts” for the city of Cracow – a probationary hypothesis can be made. According to the author, electric passenger and passenger-freight lifts in the Prussia and Prussian partition were known and installed with great

interest in the whole area (both significant and small cities). Such a situation may indicate a high public interest in modern technology in the area at the turn of the 20th century.

In the case of the Austrian partition, the area studied (bounded by today's Polish borders) is much smaller. However, inventories of installed devices in the other cities of the partition found as a result of archival searches prove that these devices were also installed in smaller cities. It can therefore be assumed that technical awareness was similar in this area.

The situation was different in the Russian partition area. The information gathered shows that electric passenger and freight-passenger lifts were installed mainly in Warsaw and Łódź. In smaller cities, they are exceptions.

6. ELECTRIC PASSENGER LIFTS IN THE POLISH TERRITORY IN THE INTERWAR PERIOD

After Poland regained its independence, various pre-war, often already obsolete technical regulations – Austrian, German or Russian – were still in force in various country districts [Stowarzyszenie Elektryków Polskich 1932]. In 1921 the Stowarzyszenie Dozoru Kotłów (Polish Boiler Supervision Association) was established with two main branches in Poznań and Warsaw, and the Law on Steam Boiler Supervision was passed [Dz. U. R. P. No. 50, poz. 303]. Also, the Polish Electrotechnical Committee began working on new regulations and standards for the safety of electric passenger elevator usage. In 1932, the Ministry of Public Works issued Polish standards for the construction and operation of lifts PN/R-600 [BN sygn. DŹS XIA 1d; Biblioteka Śląska sygn. 4260 III]. In 1939 the Association of Polish Electrical Engineers published the Guidelines for the Cooperation of Architects and Electricians in the Construction of Electrical Equipment in Buildings [Stowarzyszenie Elektryków Polskich 1939].

By the end of the 1920s, the notion that the tallest residential building not equipped with elevators could be five-story houses began to penetrate the technical consciousness [Toruń 1929: 314-318]. At the same time, by the early 1930s, passenger lifts were slowly becoming a necessary device in residential buildings above four stories. The advantage of these devices was to help avoid fatigue and save residents' time, as well as economically, bridging the price gap between apartments on each floor. At that time, the price of a simple cabin 4-person elevator with a brick shaft was approximately 4% of the construction value of a 4-story residential building with three apartments on each floor. By then, it was a modern traction drive lifts with a drive sheave [Brach 1932: 260-263]. As Eugeniusz Raabe explains in the first Polish elevator manual, freight and passenger traction drive elevators are devices whose suspension ropes, together with a weight at one end and a counterweight at the other, are thrown over a disc with

grooves and actuated by friction in these grooves [Raabe 1939: 9]. This design made it possible to improve safety by suspending the cabin from more ropes than a cable drum, whose length increases with the number of ropes (so a maximum of 2 ropes were used there). Using a drive sheave also eliminates the danger of the rope coming loose due to a sudden cabin stop. As the drive sheave continues to rotate, slippage occurs, and thus the cable is not put into motion [Raabe 1939: 70-73]. In the case of such a construction, the engine room was most often located above the shaft. The elevator cost was reduced thanks to the smaller dead load and lowered the need for ropes and the number of pulleys. At that time, all residents could operate the lift independently thanks to the already used button controls in rental housing. The somewhat outdated crank controls, approved for use only by a specially trained operator, were installed in banks, office buildings, and public buildings, where 6- and 10-person elevators were needed. They were thus cheaper and simpler to build [Brach 1932: 264]. The passenger lift cars in the 1930s were usually made of oak, walnut, or mahogany wood and mounted on an iron frame. They were equipped with upholstered benches (fixed or folding, reclining).

Based on the introduction to the first Polish elevator handbook, passenger lifts were no longer a luxury that day but rather a necessity of life [Raabe 1939: 3-4]. However, analyzing the available literature on the issue, it was found that social and workers' housing estates built in the early 20th century and 1920s, due to lowering construction costs and thus lower standards, were devoid of lifting devices. With all this in mind, the author suggests that passenger elevators retained the character of a "luxury good" in the interwar period.

7. DEVELOPMENT OF THE POLISH ELEVATORS INDUSTRY IN THE INTERWAR PERIOD

The end of the 1920s and the 1930s was a significant development of the Polish elevator industry. There were two leading manufacturers in Poland then: Bracia Jenike (Jenike Brothers) and Roman Groniowski. In 1928, the Articles of Incorporation of the company „Bracia Jenike, Fabryka Dźwigów, Spółka Akcyjna” based in Warsaw, was approved [BN sygn. DŻS XIVA 1f,]. Their letterhead presented thumbnails of the reverses and obverses of three awards, which the Jenike Brothers Company most likely won. These were the “State Gold Medal. 1929”, “Grand Gold Medal P.W.K. Poznań 1929”, and the gold medal in Liège 1930 [Archiwum Państwowe w Przemysłu sygn. 464]. It is known from advertisements in technical magazines that this company was involved in producing both passenger and freight elevators with manual, electric, and hydraulic drives. These advertisements sometimes included graphics depicting typical devices or those that might interest the customer most. For example, an advertisement for the Jenike Brothers company from 1934 (Fig. 3) is a source of information about

the construction solutions used. It depicts a simple wooden car with glazing, moving in the middle of a staircase with a distinctly modernist design.

BRACIA JENIKE
FABRYKA DŹWIGÓW
SPÓŁKA AKCYJNA
WARSZAWA
ZARZĄD: AL. JEROZOLIMSKIE 20
 Tel. 2-20-00 i 629-64. Adres telegr. „Brajenike-Warszawa“



**DŹWIGI
 OSOBOWE
 I TOWAROWE.**
DŹWIGNIKI
 wszelkich typów, ręczne, elektryczne, transmisyjne i hydrauliczne.
ŁAŃCUCHY.
NAROŻNIKI
 do muru.
LISTWY
 do stopni.
DOSTAWA
ZE SKŁADU.
 Firma odznaczona wieloma medalami złotymi.

Fig. 3. The advertisement of the „Bracia Jenike, Fabryka Dźwigów, Spółka Akcyjna” company („Architektura i Budownictwo” 1934, z. 8)

One of the most important roles was played in Poland by the company founded by Roman Groniowski in 1902. From its inception until 1933, it produced elevators of the “Flohr” system [Prusakowski, Todtleben 2011: 19-25]. Since 1935 it had already advertised in trade magazines as „ROMAN GRONIEWSKI SPÓŁKA AKCYJNA Jedyna Specjalna Fabryka Dźwigów w Polsce, Warszawa” (ROMAN GRONIEWSKI JOINT STOCK COMPANY, The Only Special Factory of Elevators in Poland, from: „Architektura i Budownictwo” 1935, z. 3-4). Kazimierz Groniowski, representing Roman Groniowski's company, patented six inventions improving the lifting devices produced by the company during this decade. The first patent he obtained in 1931 was a Mechanical steering device for elevators [Groniowski 1931]. As he argues in the patent description, the existing push-button mechanical control systems allowed travel to any floor in the upward direction. The passenger could only descend to the lowest stop when choosing the downward direction. According to the invention, the mechanical controller device allows driving to any stop in both directions. It relies on the fact that the buttons of intermediate stops are connected automatically with one of two electromagnets, switching the direction of rotation of the motor. In 1932, Kazimierz

Groniowski received a patent for an instrument protecting three-phase electric circuits [Groniowski 1932]. His next invention, a button assembly for an electric elevator, simplified the entire control system (patent granted in 1935) [Groniowski 1935a]. Separate relays for all the buttons in the assembly to maintain the control circuit when a finger was removed from the button became unnecessary. This invention reduced the number of cables and production costs. One of the most important innovations, from the point of view of safety in the use of passenger lifts, patented by Kazimierz Groniowski in 1935, was the locking device for the lift (Fig. 4) [Groniowski 1935b]. This mechanism solved the problem of opening the shaft door not only when the car was at the stop but also while it was passing through the stop.

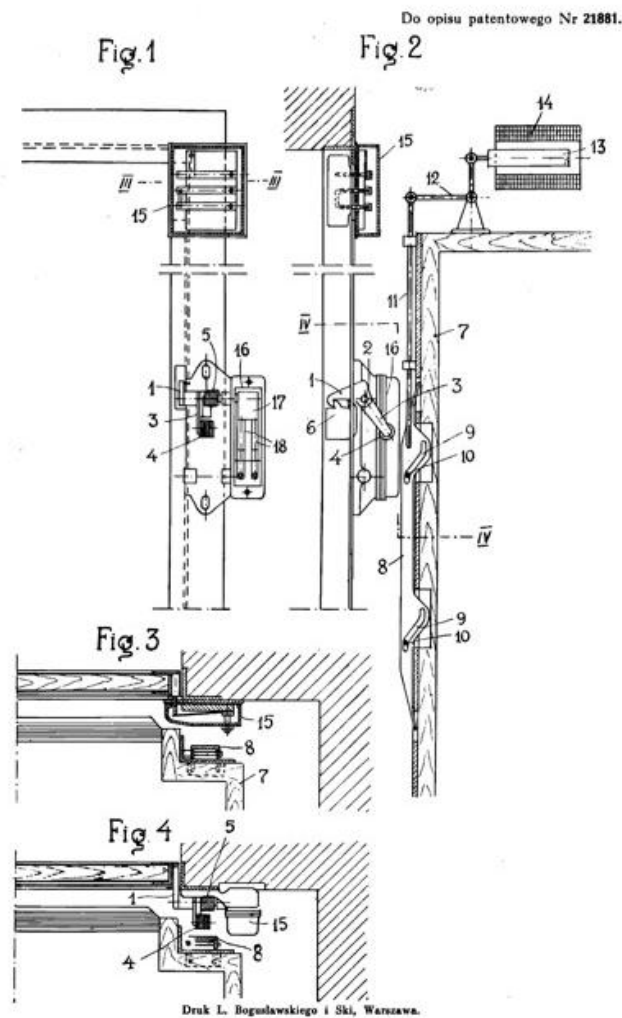


Fig. 4. The locking device technical drawing for the lift from the Patent No 21881 by Kazimierz Groniowski [Groniowski 1935b]

In 1936, Groniowski developed his earlier invention, obtaining a patent for a self-adjusting device for adjusting the direction of rotation of an electric elevator motor with push-button control [Groniowski 1936a]. The last patent he obtained, also in 1936, was for an electromagnetic brake (Fig. 5) [Groniowski 1936b]. It is worth noting here that this invention was included in the first Polish elevators handbook by Eugeniusz Raabe as a “Groniowski system brake”.

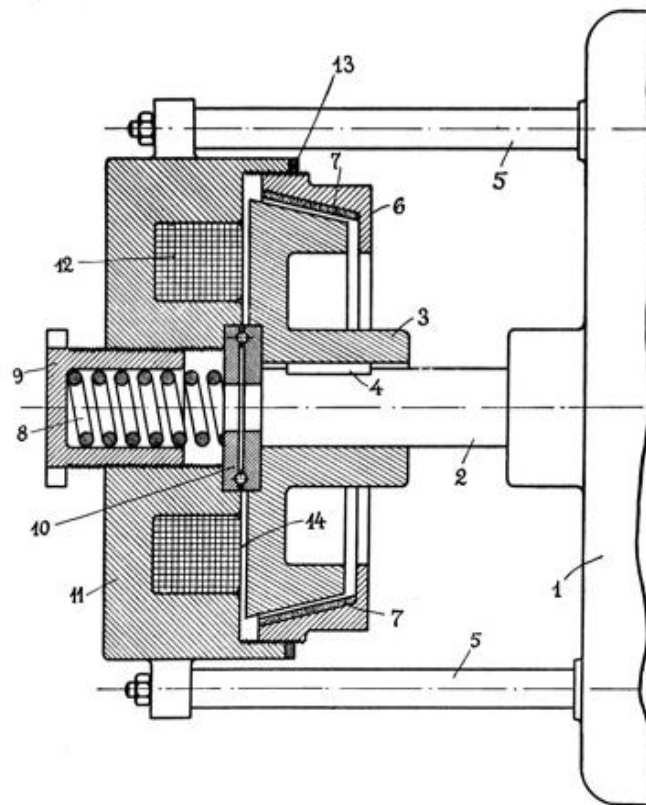


Fig. 5. The electromagnetic brake technical drawing for the lift from the Patent No 23479 by Kazimierz Groniowski [Groniowski 1936b]

8. IMPACT OF THE ELEVATORS ON CHANGES IN THE FUNCTIONAL AND SPATIAL LAYOUT OF BUILDINGS

In the studies analyzed, architectural researchers generally focused on the economic history of the cities, the change in population, the impact of the incorporation of neighboring communities into city boundaries, and the form and architectural design of the buildings. The building's technical equipment issue was primarily mentioned when

describing specific buildings or was completely ignored. Only scholars of Wrocław's trading and department stores from the 1920s paid attention to the consequences of the introduction of passenger lifts into these buildings, which were the cost-effectiveness of using the higher floors, which were already easily accessible as a result.

In the second half of the 19th century, the architecture of residential buildings changed essentially. Until then, a building was generally a self-contained, simple unit with at most one or two stories above ground. In large European cities, it was replaced by five- and six-story tenements, which over time changed (expanded and diversified) the traditional image of the house. Beyond these most visible changes, the interior of the building became more and more crisscrossed, filled with a network of pipes, cables, and shafts. Central heating, sewage systems, intercoms, passenger lifts (initially hydraulically powered), and, somewhat later, electricity were introduced. The creators of the first multi-story buildings in New York and Chicago pointed out that a passenger elevator was essential for further increasing the height of buildings above a certain number of floors [Bernard 2014: 13-14].

The pace and extent of the progressive mechanization of life were different in America and Europe, as the example of elevators attests. In the 1860s, passenger elevators were already standard in the United States East Coast large hotels. By the late 1880s, they were widely used in all multi-story residential and commercial buildings. In Europe, this means of transportation was adopted much later. In the 1860s, it remained almost unknown, and until the late 1980s, it was a relatively rare building element. The increase in interest in vertical transportation of people inside a building came when, in the 1890s, hydraulic elevators were replaced by devices powered by an electric motor [Bernard 2014: 16-17].

In addition to the speed of its spread, the location of passenger elevators inside a building was also different. Since the 1870s in the United States, all multi-story buildings' core, the backbone, and the main element of vertical communication were the elevator shafts [Bernard 2014: 17]. In comparison, at the beginning of the 20th century in German public buildings, communication between floors was still mainly by stairs, and elevators were treated as an additional element [Dümmler 1907: 687-688]. Passenger lifts installed in the middle of open staircases, characteristic of late 19th and early 20th-century residential buildings in Paris and Vienna, basically disappeared in the United States with the end of the 19th century [Bernard 2014: 17].

On the one hand, the disappearance of the passenger elevator behind brick walls was a response to devastating fires in which freestanding elevator shafts, wooden cabs, and sometimes guides contributed to the rapid spread of fire. On the other hand, it was a response to deadly accidents where passengers leaned out of unenclosed cabs and collided with construction elements. Therefore, engineering literature on the construction of passenger lifts between 1870 and 1900 constantly focused on how to improve safety and separate the shaft. Issued in 1893 in the German Empire, the first set of regulations governing the construction of elevators for the city of Berlin and its suburbs

mandated the enclosure of the space in which the car moves with solid walls. Exemptions were allowed for lifts installed in stairwells, provided the shaft was enclosed with wire mesh with a maximum opening size of 0.4 inches (1 cm) [Bernard 2014: 38-39].

Based on the author's field inventories, it can be concluded that passenger elevators installed in the middle of open staircases were still in favor in Poland at the beginning of the second decade of the 20th century. Devices of this type have been inventoried in Bydgoszcz, Krakow, Lodz, Poznan and Przemyśl. Most of them have openwork shafts filled with wire mesh to prevent access to the shaft, indicating that similar legal (building, technical) regulations were in force as in Berlin (mentioned above).

With the introduction of elevators for vertical transportation of people inside buildings, there was an ordering of the vertical arrangement of buildings by stabilizing floor categories, eliminating confusing half floors, and introducing repetitive floor plans. On the other hand, facilitating access to upper floors, to which one no longer had to climb stairs, led to significant changes in the hierarchical structure of hotel, residential and commercial buildings. Before, the price for a hotel room decreased with height, so the cheapest rooms were on the top floors and the same in rental townhouse apartments [Bernard 2014: 65-72]. In commercial houses, the higher floors were previously unprofitable [Kirschke, Kirschke Schlimme 2020]. Thanks to the installation of elevators, the higher floors became more prestigious. Alfred Wiener pays special attention to elevators, which in the "last 15 years" have become extremely important to all buildings [Wiener 1912: 84-85].

In Poland, electric lifts became almost standard equipment in apartment buildings as late as after the 1930s. Local laws in some cities (e.g., Gdynia) imposed an obligation to install passenger lifts in buildings higher than four floors [Dąbrowski 1936]. However, the social and workers' housing estates built in the early 20th century and 1920s, due to lowering construction costs and thus lower standards, were devoid of lifting devices. Based on this research, the author considers that elevators maintained the character of a "luxury good" even in the interwar period in Poland. So far, the inventories allow us to assume that passenger lifts were already installed mostly in brick shafts (fire protection and security aspects). In the case of equipment located in the middle of the stairwell, it was observed that there was at least partial protective covering in the form of wire mesh in sensitive areas (in the case of active equipment, contemporary additionally thickened).

A significant number of electric passenger lifts in Gdynia, Lodz, Krakow, Katowice, and Warsaw, which have survived to the present day (or have been removed in the last ten years), are or were furnishings of big-city tenements built in the 1930s. In the case of Gdynia, this was a pivotal period for developing this promoting modernity of a port city with high political and propaganda significance. Katowice, Krakow, and Lodz became provincial cities after 1918, and Warsaw became the capital, significantly raising their importance. In addition, the broad autonomy granted to the Silesian province and a strongly developed economy and industry contributed to the intensification of the construction movement in Katowice in the 1920s and 1930s. This city

played the pioneering role at the beginning of Polish high-rise buildings, erected using a welded and riveted steel skeleton, with electric elevators providing communication.

Poznań is an enigma in this context. During the partition and interwar period, this city was the capital of Poznan province, which importance was strengthened by the 1929 General National Exhibition organization. Despite this, no luxurious big-city modernist tenements were built here, probably because the priority for the new Polish city authorities was to provide housing for the poorest and middle-class residents, which in the run-up to the war was provided by private building initiatives [Ruciński 1929]. Wealthier residents in the 1920s ensured an adequate standard for themselves by buying luxury townhouses and villas from Germans leaving the city. Private modernist tenement houses began to be built on the undeveloped sites after 1930. They were mostly plain, with finishes indicative of average standards [Jakimowicz 2005: 102]. Therefore, the number of passenger lifts installed in Poznań in the interwar period was negligible.

9. SUMMARY

The research confirmed the author's conjecture that the electric passenger elevators installed in apartment buildings at the turn of the 19th century in the area of present-day Poland were luxury equipment. While in the United States, they led to a change in architectural design (the elevator shaft was the core of the building), in Poland, as in Germany, they were an addition to the main communication element, the staircase.

At the end of the 19th century, the drive was realized with drum drive, and the lift shafts were most often located in the middle of the staircase (openwork with mesh protection or completely open), less often with solid brick walls. Cars were made of wooden, frame, and panel construction, rectangular in plan, rarely polygonal (in the case of unusual shaft and staircase sizes). The exception is one passenger lift with a decoratively designed metal cabin, preserved in Grudziadz.

For elevators installed in the interwar period, the drum drive has already been replaced by a traction drive. These are primarily wooden cars moving in masonry lift shafts, with a few exceptions of openwork construction in the middle of the staircase. The change was driven by a desire to increase user safety, reduce the risk of accidents and limit the spread of fires inside buildings.

Regional differences were found mainly in the manufacturers more frequently chosen in the areas, which was probably related to the borders of the partitions. In Cracow, the most preserved elevators are those of the Viennese companies Wertheim and Stefan Sowitsch and a few devices of the less popular manufacturers A. Freissler and Hans Füglistner. In Poznan, Wroclaw and Olsztyn, there are devices of German manufacture by companies such as Carl Flohr Maschinenfabrik Berlin, J. Schammel Breslau or C. Herrm. Findeisen Chemnitz-Gablenz. Because of the demonstration of Polish

architecture and technology capabilities in Gdynia, most of the lifts installed were produced by the first Polish factory, Roman Groniowski. At the same time, most of the lifts preserved in Katowice were manufactured by the Viennese companies Wertheim and Stefan Sowitsch. Data collected so far shows no clear regional division regarding manufacturers, especially in the interwar period.

Much of the information obtained results from analysis of data collected during inventory trips. Historical passenger elevators treated as material documents of history were a source of information for the author on a par with archival materials and available literature. This research shows how important it is for the recognition of the history of technology to thoroughly study and inventory the surviving resources of monuments of engineering art specific to the discipline under study. The product of the research is also the first catalog of preserved historical passenger elevators in Poland, containing 112 recorded lifts and 30 locations of non-preserved devices confirmed by conservators.

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**HISTORYCZNE WYPOSAŻENIE TECHNICZNE BUDYNKÓW
MIESZKALNYCH I UŻYTECZNOŚCI PUBLICZNEJ. ELEKTRYCZNE DŹWIGI
OSOBOWE NA ZIEMIACH POLSKICH OD 1899 R. DO KOŃCA LAT 30. XX W.**

Streszczenie

Dźwigi osobowe (windy) stały się we współczesnym budownictwie nieodzownym elementem wyposażenia budynków. Dążąc do wypełnienia luki w aktualnym stanie wiedzy na temat historii rozwoju konstrukcji dźwigowych w Polsce na przełomie XIX i XX w., autorka podjęła się realizacji projektu naukowo-badawczego. Badania obejmowały trzy główne etapy: kwerendy archiwalne, wyjazdy inwentaryzacyjne na terenie Polski w celu opracowania katalogu oraz analiza zebranych informacji. Artykuł ten stanowi podsumowanie wyników badań oraz próbę odpowiedzi na zasadnicze pytania dotyczące rozwoju transportu pionowego w polskim budownictwie.

Słowa kluczowe: dźwigi osobowe, zabytkowe dźwigi, dziedzictwo techniki, historia urządzeń dźwigowych, historia wind, wyposażenie techniczne, dozór techniczny