

**ABSTRACT OF PHD THESIS**

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**“On the Street Lighting Necessary in Civilised Cities”**

**The history of public lighting in Hungary before 1914**  
– presented through the example of some municipality –

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## I. Previous research, problem definition

As far as the history of public lighting in Hungary before 1914 is concerned, it cannot be separated from the history of the cities, because public lighting was an indicator of the development of the cities. So far there has been no-one in Hungary to deal with the history of public lighting, and also, there are only few experts who work in this field abroad. This is the reason why a comprehensive history of public lighting in Hungary has not been written. Until this day, the only major research in the field of the history of public lighting was *The Development of Public Lighting in Budapest (A közvilágítás alakulása Budapesten)* by Mihály Pásztor, published in 1929, although the journals of the Hungarian Reform Age also dealt with the history of lighting and one of the first articles on the history of public lighting, “*Street Lighting*” (*Utcavilágítás*), was published in 1863, in the columns of the *Vasárnapi Újság*. The journal *Városi Szemle*, first published in 1908, started a series of articles with the title *The Lighting of Cities (A városok világítása)*, but dr. Imre Forbáth, the author of those articles only presented the history of public lighting in Western Europe, through the example of Paris. Apart from a few exceptions, papers on the history of public lighting in Hungary were only published after 1970. Papers on the history of Hungarian cities deal with public lighting in very brief. However, this approach has changed, as demonstrated by collections of resources on the history of Hungarian cities, published at the turn of the millennium, which include resources on public lighting.

The history of infrastructure in Hungary has been in the focus of my interest for long, and the most interesting periods in this field are the 19<sup>th</sup> century and the age of dualism. Concerning the history of lighting, this period was also interesting, because this was the age of the development of modern lighting, when something new occurred almost each year, or experiments were conducted and lamps were improved. After defining the topic, I had to choose a narrower field for my research, because it would be a huge job to write the history of public lighting of all places in Hungary, although usually only the cities had street lighting. It seemed reasonable to deal with the largest cities, which at the end of the century were municipalities. The 26 municipal cities are, however, located far away from each other, and 15 of them are beyond our present-day state borders. At the turn of the 20<sup>th</sup> century, it was believed that public lighting in cities in the Great Plain of Hungary, especially with service pipes, was difficult to build because of the large area of the cities. In spite of this, the statistical data from that period show that the “lightest” county of the country was Bács-Bodrog.

Researching the cities of the Great Plain, therefore, offers an interesting historical point of view for investigating the history of public lighting in Hungary. For this research of history it is important to note the history of public lighting of the cities with the most inhabitants after Budapest. Concerning the number of lamps, around 1910, Budapest was followed by Szeged. As to the number of inhabitants, Szabadka was the next one after Szeged, however, there were more street lamps in Kolozsvár, Kecskemét, Pozsony and also in Temesvár than in Szabadka. The case of Szabadka offered an opportunity to research a typical city of the Great Plain, which was made even more special by the fact that it was the only city where a gas works and an electric plant was built within a decade. For researching the development of public lighting in the smaller municipal cities, I chose a city from Category 2 (cities with 50000 – 70000 inhabitants), as per the 1910 statistics, in particular, a city in the Great Plain, Kecskemét. From the last category (cities with less than 30000 inhabitants) I chose Baja, because this is the only city which is located within the present-day state borders. The development of the two cities was different. While the former was flourishing in the first half of the 19<sup>th</sup> century, the latter developed at the end of that century. Concerning the history of lighting, in one of the cities, Baja, a gas works was built, operated by an entrepreneur, while the other, Kecskemét, built an electric plant at the end of the 19<sup>th</sup> century, operated by the city itself.

## II. Methodology

Due to the fact that only few papers have been written on the topics, I used all available resources. As a result, the list of references includes resources of different scientific value. I focussed my attention mainly on finding resources that date back to the 19<sup>th</sup> century, or before 1914.

To restrict the field of my research in the archives, I chose four cities of which lighting histories had not been written. When researching Baja, I found Carl Eggels' name in relation with the attempts to establish gas lighting in the early 1870s. I could only learn more about him in the National Archives of Hungary, in the documents of the Ministry of Home Affairs. In many cases, the documents from the National Archives made my research on the four cities complete, because they still have documents that are already missing from the local archives of the cities, e.g. early inventories, city budget calculations. I found a lot of interesting information on the public lighting histories of other cities, in which I was also interested.

When collecting the information, I had to face the fact how little we know about the public lighting of the city the history of which is most researched. However, to analyse the situation of the cities in the country, I had to know

how public lighting developed in the capital, and also, I needed data for comparison, e.g. what “lighting contracts” were concluded in Budapest, or, what lighting calendars they had.

Most of the research in the archives was based on different index books. Since I wrote my thesis also on the history of public lighting, I already knew what documents I had to read, apart from those of public administration. I paid special attention to finding public lighting calendars, because those small printed sheets only remained in the archives in most of the cases.

Concerning the other cities, I obtained information about the development of Hungarian public lighting, as much as possible, from monographs and the local press. I used mainly printed materials and newspapers from that age, but, of course, I could not read all the newspapers from the first half of the 19<sup>th</sup> century, when they had less journals and newspapers.

The works on the history of technology published recently in Hungary are either popular scientific papers, or, do not deal with problems of lighting history that I was interested in. So, I read literature on lighting from the 19<sup>th</sup> century. Literature in Hungarian is very limited in this field, so it was essential to read literature in foreign languages, mostly available abroad.

In addition to the written resources, I was trying to find pictures, because a view of a street, mainly a photo, includes a lot of information, even if the structure of the lamps cannot be studied in most of the photos (as they are not visible).

Finding maps was a separate research, because places of lamps were not indicated on the cadastral maps, which usually can be used well for other purposes. The major part of the maps that include data related to the history of public lighting can be found in the map collections of the archives. In some cases, I found maps in monographs on the history of the city or that of a plant.

When writing this dissertation, I concentrated only on the chosen topic, which was not always easy, since the history of public lighting is a multidisciplinary field, offering “visits” to other disciplines. So, I only mention the history of the cities only when it is necessary to mention some dates for discussing the history of public lighting. I have not dealt with researching the composition of the inhabitants either, because the statistical data for the city centres in the Great Plain do not give accurate information, showing total figures with the inhabitants of the suburbs.

There are several ways to present the history of public lighting in Hungary. One possibility is to show the appearance of modern infrastructure through the development of the capital. This approach cannot be followed in case of public lighting, because the capital, due to its size, demanded a different kind of public lighting than the other cities. In this case, the differences are not only quantitative, because public lighting was different in

Buda and Pest, so there are also qualitative differences, because in certain periods, different kinds of lamps were used in different districts of the capital. Concerning public lighting, it was not just the case that “*sometimes it happened that some of the cities left behind Budapest in a service*”<sup>1</sup>, because dozens of cities were ahead of Budapest, both in paraffin and electric lighting.

The other possibility is to write the history of Hungarian public lighting comparing with that of Europe, focussing on the processes in which its development in Hungary was embedded. An analysis of this kind would partly answer the crucial question of 19<sup>th</sup> Hungary, i.e. how much Hungary was behind Europe. In this case, however, a basis for further comparison needs to be chosen, because the European history of public lighting differs in each country. There are many resources for researching the history of public lighting in Western Europe, in contrast with Eastern Europe, where hardly anything is available, the situation being the same in the Northern and Southern European countries.

Another possibility to present the history of public lighting in Hungary is through the changes of lighting history in general, because this way both of the approaches described above can be included, the periods for the research also being determined. In the 19<sup>th</sup> century, new kinds of lighting materials, methods, and lamps occurred. From this point of view, the second half of the 19<sup>th</sup> century is the most exciting, when new, modern methods of lighting appeared in the streets of Hungary, almost in every decade. These lighting methods are not only called ‘modern’ because of the date when they appeared,<sup>2</sup> but also because those lighting materials could not be made at home or in a handicraftsman’s workshop. On the other hand, those materials were spread all over the world, being closely linked to the Western civilisation and the change of lifestyle, caused by the industrial revolution.

In my dissertation, I have combined several possibilities of presenting the history of public lighting, so it is divided into two parts. In the first part, in chronological order, materials and instruments of public lighting are presented, this part of the dissertation being related to the history of technology. The second part of the dissertation presents how public lighting was operated, through a detailed analysis of different aspects of public lighting. In the latter part it was easier to compare the cities, since the aim of the dissertation was not only to write the history of public lighting of each of

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<sup>1</sup> Zoltán Fónagy: Az urbanizáció vívmányai [The Achievements of Urbanization], In: Magyar Kódex, 5, Osztrák-Magyar Monarchia, Magyarország művelődéstörténete 1867-1918 [Austro-Hungarian Monarchy, The Cultural History of Hungary], editor-in-chief: József Szentpéteri, Kossuth Kiadó, Budapest, 2001. 406.

<sup>2</sup> The three modern ways of lighting are: gas, mineral oil, and electric lighting

the four cities, rather, to place them next to each other, to deduce a general view of public lighting of that period.

### III. New results

The periods of the history of Hungarian public lighting can also be defined by the lighting materials used. The first period was lighting with tar or lard—or burning them, to be more accurate—in the 18<sup>th</sup> century. In the next period, oil was used, and that period can be divided into two: vegetable oil lighting, I call this “oil lighting”, and mineral oil lighting. Gas lighting started in 1856, replaced by electric lighting from 1884 on.

There is, however, a certain overlap between the periods defined by lighting materials, because at the beginning of gas lighting, oil lighting was used in the cities which had public lighting. At the turn of the century, electric lighting replaced paraffin lighting, at most of the places. According to a contemporary opinion, the cities should have gone through all phases of development (oil lighting – gas lighting – electric lighting). In spite of this, it happened many times that the three different lighting materials were used at the same time for public lighting, as in Budapest, after 1909.

There are even more problems if the periods of public lighting are determined by years. This task may be carried out for individual cities, but, when several cities are examined, the periods will be defined by different years, almost in every case. Despite this, my aim was to determine the periods according to this principle, as follows:

	<i>period</i>	<i>Type of public lighting</i>
1.	18 <sup>th</sup> century and before	Our first cities with street-lighting (Chapter 2.1)
2.	First half of the 19 <sup>th</sup> century	Oil lighting (Chapter 2.2)
3.	After 1849	Rapid spread of public lighting (Chapter 2.2.3)
4.	1867-1872	Spread of gas lighting (Chapter 4)
5.	1880s	Appearance of electric lighting (Chapter 5.2) Competition between gas and electric lighting starts
6	Millennium	As the cities were preparing for the Millennium, they developed and modernised their public lighting infrastructure
7.	Turn of the century	Appearance of acetylene gas lamps, also used for public lighting in smaller towns (Appendix)
8.	Around 1905	Spreading of Auer burner (Chapter 4.4.1) Rapid increase of the number of electric plants

The beginning of public lighting in Hungary can be dated back to the 18<sup>th</sup> century, but there are some data that suggest streets—or gates—were lit during the night also in the Middle Ages. There were different lighting materials that were used for this purpose—usually lard or tar. Public lighting was only established 80 years after Vienna, however, in the 18<sup>th</sup> century, cities of Hungary were among the first ones in the Austrian Empire to follow Vienna: Pozsony and Temesvár having public lighting earlier than the other Austrian cities. The next period was the first half of the 19<sup>th</sup> century, “the age of oil lighting”, when more and more cities had lighting, which was facilitated by the new lighting material, colza-oil, under the general conditions of the economy. There was a change also in the lighting instruments: the oil burning lamps were replaced by lanterns—Réverbère lamps, and even the more advanced Argand lamps occurred in the streets. Within the period of oil lighting, 1850 was a turning point, since after the Revolution and War of Independence of 1848/49, most of the public lighting, built during the Reform Age, disappeared—the cities could not afford such a luxury. On the other hand, from the 1850s, the state authorities obliged the cities to introduce public lighting. From that point on, it could not happen that streets were not lit up during the night because of having no money.

It is unknown when the first Argand lamps occurred in Hungary, however, they were used for lighting streets already in the Reform Age. The early spread of the Argand lamp is demonstrated by the fact there were several Hungarian words to call it: “argándilámpa”, “árkándiái” or “áreánti”. Although the first public lanterns were of this expensive kind, they were only placed at a few important places. For example, in the inner city of Győr, public lighting was started in 1816, the first Argand lamps were only used twenty years later. In Szeged, public lighting was introduced in 1827, but only 16 of the 352 lamps (4.5%) were “argándi” in 1850. The number of Argand lamps increased in the following years. The city had 163 “áreánti” lamps (31.8% of all lamps) in 1859. In the second half of the 1860s the number of Argand lamps decreased again, one reason being the introduction of gas lighting, because the “burner” of the Argand lamps could be used for gas lighting, and the other reason was possibly the fact that the burning structure used in the Argand lamps deteriorated earlier and its replacement was more expensive, so the lamps that were no longer suitable for public lighting were removed.

In the 1850s and 1860s, oil was still used for lighting in most of the cities. It was from the 1870s when vegetable oil disappeared from public lighting in the cities of Hungary and was replaced by mineral oil. From the 1850s on, night lighting of streets was getting more and more widespread and from that time, it was not only a privilege of commercial centres and some free royal boroughs any more. This spreading of public lighting was not only because of

the expectations and decrees of the state, but also as a consequence of modernization and urbanization. The first sign of this was the use of steam boats, because steam boats did not only arrive in one place during the day. The other important factor in this process was the development of railway lines, for the same reason.

Photogen—a mineral oil derivative, forgotten by today—was first produced and sold in the mid-19<sup>th</sup> century. It was a distilled lighting substance made of stone coal or tarred slate, and it had a great contribution to the spreading of paraffin, because the technology and infrastructure used for its manufacturing could be used later for oil refining. The appearance of gas lighting also had an impact on the spreading of mineral oil lighting. In many cases, the cities that introduced the new lighting technology, sold their lamps by auction, which could serve as a starting point for public lighting elsewhere. They also contributed to the expansion of the lighted area within a city, because lamps used earlier in the inner cities, were now used in the suburbs. We do not know much more about paraffin lamps used in streets than about their predecessors, the oil lamps. Some of those lamps were made by local tinsmiths—mainly in the 1860s—, or possibly were purchased from Budapest tinsmiths or lamp manufacturers. As of the 1860s, more than twenty years were needed to spread mineral oil lighting in public lighting in Hungary, and this process ended only at the beginning of the 20<sup>th</sup> century, when almost all of the cities had public lighting, and even some of the more advanced villages did. In 1905, when an electric plant in Zombor was put into operation, the last municipal city to have such a plant, a new period of infrastructural development started in Hungary. In the cities that were at the top of the legal hierarchy of cities, the most advanced—industrial—public lighting replaced the old public lighting. Paraffin lighting did not completely disappear from those cities though, but was only used in the suburbs from that period.

The period of gas lighting in Hungary started in 1856—the year of the introduction of photogen lighting—, because in that year, two gas works were put into operation in the two capitals: the first one in Pozsony, and at Christmas in Pest, too. This relatively late introduction was partly because of the Revolution and War of Independence in 1848/49, because, in the case of Pest, the revolution hindered the fulfilment of a contract, which had already been approved. In the 1850s, during the period of neo-absolutism, the country did not seem to be a safe place for foreign capital, even though the Austrian government supported capitalist enterprises. The spreading of gas lighting is closely linked to the general economic state of the country, because the Gründerzeit after the Compromise of 1867 also appeared in this branch of industry, but the construction of most of the gas works was hindered because of the crisis from 1873 on. Based on resources found in archives, it can be

reconstructed that three times as many gas works could have been built if the financial collapse of 1873 had been avoided. Still, by 1873, 18 gas works were built in Hungary, and 11 of them were put into operation after the Compromise. We have no exact data about how many cities intended to introduce gas lighting, but eventually did not. According to the documents of the Ministry of Internal Affairs and the Procurator's Council, such cities included Kecskemét, Szatmárnémeti, Zombor, Eperjes, and Esztergom. In another group of the cities, gas works were built later, by another entrepreneur, e.g. Baja, Komárom, Pécs, Újvidék, Nagyszombat.

The economic crisis of 1873 hindered the spreading of gas lighting in Hungary for almost a decade. The construction of several gas works was already in process at the beginning of the 1870s, but they were not completed because of the bankruptcy of the foreign entrepreneurs, although several cities had valid—and approved—contracts. Most of the contracts were concluded by Carl Eggels' agent in the country. Even after several years, those cities were still expecting that he fulfils the commitments as per the contract. According to Sándor Fechtinger, an Esztergom citizen, the representative of Carl Eggels of Berlin, was actually a Prussian spy, because, for building the gas pipe network, they needed an accurate map of the city.

After 1885, the movement for establishing gas works revived again. This was partly because of Auer von Welsbach's invention, the Auer burner (gas/incandescent mantle), which made gas lighting competitive again. From the perspective of the history of economy, the National Exhibition of 1885, which attracted international attention to Hungary, may have evoked such an effect. However, in most of the cases, there was a third cause. For such a long-term investment, the leaders of most of the cities still considered gas lighting safer than electric lighting. They were right at that time, and their decision was not only verified by the example of Temesvár, where electric lighting had a lot of problems in the first year, but also the Exhibition on Electricity in Vienna, in 1883, where they did not like the lighting towers, presented as the future development of electric public lighting.

In the 1890s Hungarian towns and cities were competing with each other in building electric plants. At the same time, acetylene lighting was also spreading, but they gave up using acetylene in public lighting when they experienced its dangers, at the beginning of the 20<sup>th</sup> century. The competition did not facilitate the new spreading of gas lighting, but it was promoted by Auer von Welsbach's improved lamp, patented in 1892, which made lighting gas cheaper than electricity. In the period between 1900 and 1905, gas works were constructed in the Highland, from which only the gas works of Medgyes in Transylvania are excluded. Those gas works, as opposed to the earlier ones, and in a similar way to the electric plants, were built as city properties. (So was the one in Medgyes, but another one in Érsekújvár was not.) It is

another feature of the Highland gas works built in that period that they were constructed by Manoschek, a company in Vienna.

The last period is the early 1910s, when the last gas works were built at the rimland of the country: Marosvásárhely, Dicsőszentmárton, Resica, and finally, Nagyszőlős, in 1913.

Beside building gas works, the Auer burner (gas/incandescent mantle), mentioned earlier, had an important role in public lighting, and only a few people know that Budapest was the first city in the world where one street was lit by Auer burners as early as in 1892. The experiment was carried out on the occasion of the 25<sup>th</sup> anniversary of Francis Joseph's coronation, when the street was illuminated, and after the celebration the lamps were not removed but the testing of the lamps continued. Two years later, the General Austrian Gas Association (the owner of the Budapest gas works) suggested that in the busy streets of Pest, Auer burners should be installed for public lighting. The Association was granted permission in 1895, but the Auer burners in Fűrdő Street were only finalized on August 1, 1896. From October 1893 on, Auer burners lit the Tunnel in Buda as well. In the following year, in the Eastern end of the country, Brassó, they used the light of Auer burners. In 1894, Auer burners were manufactured in Hungary, as in the same year the Hungarian Incandescent Gas Light (Auer Light) Corporation was founded. From 1895 on, in one district of London, Kensington, incandescent gas light, i.e. Auer burners, were used for lighting the streets. In the capital of the Austro-Hungarian Monarchy, Vienna, the first tests were implemented with the Auer burner only on February 1, 1896. In the same year, Auer burners appeared in the streets of Hungarian country towns, Debrecen having such street lamps in 1896, or even Pozsony, where almost half of the lamps (265 pieces) were Auer burners. In 1896, incandescent gas light lit public spaces in Kolozsvár, Nyitra, Sopron and Miskolc. It was only around 1905 when the use of Auer burners became common in public lighting, because gas works, although it was their obligation of innovation by contract, were seldom willing to do so by themselves, and they opposed the introduction of Auer burners especially in public lighting. The gas works were usually willing to introduce such burners only when their contract was expiring and negotiated the prolongation of the contract, although, because of the smaller consumption, it would have been beneficial for them, too.<sup>3</sup> There are some exceptions though, because some gas works were built at the beginning of the 20<sup>th</sup> century and in those cities Auer burners were planned and used for public lighting from the beginning.

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<sup>3</sup> Lower consumption was preferable for the gas works because this way they did not have to build new gas containers due to the increasing consumption as the number of clients and consumption was rising.

*Periods of public lighting with gas in Hungary*

	<i>Period</i>	<i>Features</i>
1.	1855-1867	First gas works: in the large cities of Hungary
2.	1867-1873	A fever for establishing gas work with little results
3.	1874-1881	No new gas works built
4.	1885-1890	Gas works built at the Great Plain by the Riedinger company, mainly in Bács-Bodrog county
5.	From 1892	Spreading of the Auer burner
6.	1900-1905	Gas works in the Highland, built by the Manoschek company
7.	1910-1914	New gas works in the Eastern part of the country

When talking about electric public lighting, the view generally accepted at the beginning of the 20<sup>th</sup> century, which suggested that gas works hindered the spreading of electric lighting, needs to be re-considered. This opinion was true for the Western European countries, but there were much fewer gas works built in Hungary than electric plants. On the other hand, in the majority of the cities where gas was used for lighting, and the city was rich, or electricity was demanded by the industry present in the city, electric plants were built, because those cities were not frightened by the legal procedures, possibly lasting for years, that may have been initiated because of the introduction of the new way of lighting. The opinion suggesting that some of the cities did not build gas works in the 1870s and 1880s because they “foresaw” the victory of electricity over gas is ahistoric and anachronistic. The competition of the two lighting materials only ended in the first half of the 20<sup>th</sup> century, after World War I. I did not only discuss gas lighting at length because this is a neglected field of research, but also because most of the cities that had gas works had city rights, but those that did not have such rights were also county capitals, apart from a few exceptions. So a conclusion can be drawn that gas lighting in the age of dualism was not only introduced in the richest cities, but was also a symbol of urbanization.

In the second part of the thesis—entitled *Organizing public lighting*—the term “public lighting” is discussed, focussing on what factors were needed for operating it. The most important instrument needed for running public lighting is money. Payments had to be made for public lighting in all ages, but there have been differences concerning who and how much had to pay. Certain forms of financing public lighting cannot be linked to the periods of lighting history. From the 17<sup>th</sup> century on, when public lighting was hired and lamplighters occurred, it was not the citizens that had to light the street lamps for the night. This means that public lighting became a city service. From the mid-19<sup>th</sup> century on, as gas works appeared, waterworks and further public

utilities occurred. If the lighting company (the gas works or the electric plant) was owned by the city it happened that the city did not have to pay for public lighting, in that case, a part of the profits of the public utility was used for financing public lighting.

In the first half of the 19<sup>th</sup> century, there was another way to finance public lighting, because the citizens themselves paid for it, or, raised money for street lighting through the casinos, or maybe Lamp associations.<sup>4</sup> Of the larger cities, Pest and also Buda separated a certain sum of their income to use public lighting, as early as in the 18<sup>th</sup> century, followed by the other cities in the second half of the 19<sup>th</sup> century. From the first half of the 19<sup>th</sup> century, in most of the cities that had public lighting—or planned its introduction—one of the most important questions was where they should obtain the money from, while later, their “only” problem was how much they should spend for such a purpose and what method of public lighting they should choose. In both cases, it may have taken several decades for the local councillors to come to an agreement with each other, or with the higher authorities.

Supervision of lighting became necessary when the operation of public lighting was implemented by an entrepreneur. In the early period of public lighting, i.e. when vegetable oil was used in cities, supervision only included checking if the lamps were burning or not at times as per the contract. Later on—as the expectations of public lighting in the night were higher—the quality of public lighting was also important. The way this issue was treated at different places just evolved through the years and by the experiences, but there are many similarities in addition to the differences. In the first years, supervision of gas lighting in Szeged was encumbered by the fact that apart from observation, the city could not supervise the gas works because of having no measurement apparatus. The leaders of the city first faced this deficiency when they found that concerning the consumed amount of gas, they can only use the data provided by the gas works, because they could not measure the consumption of the lamps of public lighting, gas meters not having been installed. To supervise the quality of public lighting, they should have used a photometer [light meter], as per the contract, but it was only in 1877 when a “gas supervision device” was installed in the City Hall. Supervision of gas lighting was a task of the Captain’s Office, like in other cities. When the Fire Brigade was established, this task was overtaken by them. At the turn of the century, the city had its own gas lighting controller,

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<sup>4</sup> For example, in Vác, in the first half of the 19<sup>th</sup> century, the local citizens established a Lamp Association in 1840, and its membership fee was used for covering the expenses of public lighting, i.e. they bought lamps, oil, and paid the lamp lighters.

whose tasks did not only include checking the size of the flame, but also to inspect the composition of the gas.

In public lighting, one of the most important tasks was to determine when the lamps should light. Back in the Middle Ages, they were not lit at the same times either, there were days—e.g. at full moon—when the lamps were not lit at all, while, at other times—during the summer in general—lighting was paused for a whole month. Lighting calendars were important documents of public lighting supervision, because such calendars were used to decide if the entrepreneur lights the lamps at the right times. When there were no lighting calendars, supervision of public lighting may have been paused temporarily.

In most of the cases, lighting calendars did not determine exactly which lamps should be lit, but the gas lighting and electric lighting calendars had separate columns for “half night” and full night lamps. “Half night” lamps were operated only until midnight, but they were lit at the same time the full night ones were. Lighting calendars did not define either if there was a difference between summer and winter lighting. In Kecskemét, for example, public lighting was for the whole year, but only a few lamps were lit during the summer, but the lamps of the city park were lit only in that season.

The first lighting calendars were made as time was measured more precisely and a demand for more precise time evolved, because until a precise time determination was not available for the people, the lamps were not to be lit up “by the clock”. If the city had no tower clock, the citizens—at least in the first half of the 19<sup>th</sup> century, but also in the second in general—could not check it, but most of them did not need to know the time accurately.

In those times, lighting calendars were not attached to the lighting contracts concluded with the entrepreneur, the lighting hours were only referred to in a few words. For example, in the contract of Baja, concluded with István Scherk in 1847: “*they shall light from the hour when it is dark until the light dawns.*” However, in Szabadka, where the number of lamps was only one third of the lamps in Baja, lighting was determined in 1843 as follows: “*They shall light from 5 o’clock in the evening—until 7 o’clock in the morning in the winter months—and, from 8 o’clock in the evening—until 4 o’clock in the morning, in the summer.*” This system was in effect until 1849. It is a common feature of both formulations that the names of the months are not mentioned i.e. in which month the lamps should be lit up and when to put out. Both formulations only defined the durations of lighting the lamps. However, the brief formulation of the Baja regulation is one of the most accurate ones, because later on, all the lighting calendars tried to define the times of getting dark and getting light, as accurately as possible, but, as soon as they wanted to use hours and minutes for that purpose, they had to face another difficulty: momentary weather conditions could have changed those times at any time.

Real lighting calendars, in which lighting up and putting out times were given for each day, only started to spread in the late 1850s in Hungary, because of the gas works. The consumption of individual gas lamps was not measured, and since all pipe networks have a certain gas loss, they only calculated average consumption values for the gas lamps, and the accounting was based in the daily hours of lighting (burning hours), and the invoices were issued according to those hours, each month.

At the turn of the century, the larger cities studied the lighting calendars of the smaller ones, to improve their own calendars. At the beginning of the 20<sup>th</sup> century, István Kuzskó, the lighting supervisor of Kolozsvár made the greatest efforts to make public lighting systems and calendars better in the country by sharing his experiences and ideas with other cities. Among the documents in the archives of all larger cities, there are references to István Kuzskó's circular letter, although the letter itself is lost. There are two booklets of his in the National Széchényi Library, and both include lighting calendars. The first one, *The Public Lighting Calendar of the City of Kolozsvár*,<sup>5</sup> was published in 1907, and the other one is the *Guide for Gas and Electric Lighting*, published in 1908.<sup>6</sup> In both booklets, sunrise and sunset times were considered, and the latter book even included a separate column for those times. In the 1907 calendar, he explained this by the fact that traffic is the busiest at twilight in the city.<sup>7</sup>

The times determined in the lighting schedule (lighting table/calendar), or the times when the lamps lit, were not always in connection with the citizens'—or the city leaders'—ideas about time. In many cases, there was a very material reason in the background: lighting expenses. If they cut lighting time shorter, they had to buy less oil, which was expensive in those years, so they could reduce lighting expenses. In Nagyvárad, the primary instrument for terminating the expensive and bad lighting was the creation of a lighting calendar, because “*without that, you cannot even think of lighting.*”<sup>8</sup>

The quality of lighting was an important requirement in the 19<sup>th</sup> century, which continuously improved, as demands related to public lighting were higher and higher. This process can partly be traced by studying lighting contracts. On the other hand, contemporary newspapers give important clues

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<sup>5</sup> *István Kuzskó: Kolozsvár város közvilágítási naptára [Public Lighting Calendar of Kolozsvár], 1907, Kolozsvár 1907.*

<sup>6</sup> *István Kuzskó: Utmutató a gáz- és villamosvilágításhoz [A Guide for Gas and Electric Lighting], Kolozsvár, 1908.*

<sup>7</sup> *Kuzskó István: Kolozsvár város közvilágítási naptára [Public Lighting Calendar of Kolozsvár], 1907. Kolozsvár, 1907. 4.*

<sup>8</sup> *János Fleisz dr.: Város kinek nem látni mását, Nagyvárad a dualizmus korában [A City that has Nothing to Compare With, Nagyvárad in the Age of Dualism], Nagyvárad, 1997. 107-108.*

about the people's experiences about public lighting and how they rated its quality.

Apart from the objective and measurable criteria, settled by contract, there is a subjective side of the quality of lighting: what people think about it. There is always something that has an impact on it. At times there is something that is used as reference to compare to. Wolfgang Schivelbusch has an observation in his book *Lichtblicke*<sup>9</sup>, which is worth considering: the new public lighting is always more beautiful and better than the old one, and the first oil lamps “turned the night into day”, as did the Argand lamps and the gas lamps, later on. The light of electric lamps do not really fit into this process of development having so strong light that something was needed to reduce their light. Arc lamps were placed higher partly to prevent people to directly look into the lamps. Another reason was to increase the lighted area, because their luminance was strong enough to light to larger distances. As electric tungsten lamps appeared, electric lighting was made similar to gas lighting, as many places required smaller luminance than that of arc lamps. According to Schivelbusch, at the end of the 19<sup>th</sup> century, a much more important process of development took part because electricity did not only induce technical development, but also capitalism. The quality of lighting also changed not only by losing the individual character of each lamp—being manufactured in series now—but they also lost their independence, being part of a network.

After the introduction of electric public lighting, lamplighters were still needed for some decades, but, at the beginning of the 20<sup>th</sup> century, after their 250-year job, they disappeared from the streets of Hungary (and Europe). As the number of lamps of public lighting increased, the number of lamp lighters also increased. In general, of 5 persons, one was a supervisor, who organized and controlled the others' work. He had a higher salary and fewer lamps than the other lamp lighters. One lamp lighter could serve about 30 to 60 lamps (this latter usually when his wife helped him), but this depended also on the location and distance of the lamps. During the 19<sup>th</sup> century, the equipment that lamplighters used changed a lot. The invention of safety matches made their job easier, but the most important thing that made their job even easier was the appearance of gas lighting, because from that time on, they did not have to carry either a ladder, or boxes full of lamps filled with oil. After the introduction of gas lighting, the lamplighters' job was multiplied because they did not have to pay attention only to the burning of the lamps—in this respect, there was no work with the gas lamps—but to the weather conditions too, because on cloudy evenings they had to light up the lamps earlier, or at

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<sup>9</sup>English edition: *Disenchanted Night: The Industrialization of Light in the Nineteenth Century*

times when the police captain ordered so, although the lamps should not have been lit up, according to the lighting calendar.

The spaces of night lighting are partly the same in our days, too, because the centres of the Hungarian cities have not changed a lot since the age of dualism. Apart from the architecture, the public space to be lit is mostly determined by the lighting technology and the lamps used. The extension of the lighted area was not only because of using constantly improving lamp structures and lighting materials, but it also had a geographical aspect: street lamps occurred in more and more streets and districts of the city. In Hungary, public lighting occurred in the suburbs in the 19<sup>th</sup> century, the process that the great cities of Western Europe already had gone through in the 18<sup>th</sup> century.

Maps about the extension of public lighting were seldom drawn. Such extensions were usually drawn on tracing-paper, which was then placed on the original map. Hardly any of them have remained. There are much more drafts or parts of maps that were made about the location of a few lamps.

Maps always offer a significant help when we would like to clarify our knowledge on history, or to put things in space. When one deals with the history of public lighting, this kind of help can only be used rarely, because such maps were seldom drawn, and only in a limited number of copies. It is surprising that even in the cadastral maps, which can be used very well otherwise, locations of lamps were not marked, neither in the 3<sup>rd</sup> Military Survey Maps, although lamps were among the most important night orientation points in the second half of the 19<sup>th</sup> century. In those maps, crosses, wells, and other cast iron columns can be found, but most of the lamp-posts were made of wood in those days, and to a varying degree in the different cities, lamps were placed in lamp-brackets, mounted on the walls of houses, and, at least in the main square, passers-by could see iron cast lighting columns that had several brackets for the lamps.

Two forms of modern lighting, which are usually considered “more advanced”, required the building of a network. These forms were the following: gas and electric lighting. Until their introduction, no comprehensive maps were needed to mark all lamps and a network. Oil and paraffin lamps were standing independently from each other, but when a new lamp was installed or a lamp was relocated, especially a paraffin lamp, for determining its position, a small map or just a schematic drawing was needed, in which its position was marked or determined.

The first schematic map of this kind was made in Pozsony, about the lighting of the surroundings of the Mihály gate, in 1783.<sup>10</sup> Some schematic maps for lamp placements were made in Pest and Buda in the first half of the

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<sup>10</sup> The map was also published in printing – In: Hrádek, Pavel: 140 rokov bratislavskej plynárne [140 Years of the Pozsony Gas Works], Bratislava [Pozsony], 1996. 20.

19<sup>th</sup> century. Lamp location plans for some streets can be found in the Szeged office of the Csongrád County Archives. Of the four cities that have been investigated in more detail, the first drawing with the whole city, which has remained, was made in Kecskemét. Originally, in 1860, this map was not intended to mark the locations of lamps, but, as its title says, “*Pavement Draft of the Inside of the City of Kecskemét*”. Because of the few lamps in Kecskemét, there was no need to make a new map to replace the old one for a long time. The lamps were not registered by a number, but according to the location—the name of the house owner—where they were placed, as can be read in the lamp-register.<sup>11</sup>

In 1865, a new map was created about the gas lighting of Szeged with the locations of the gas lamps. The plans made by Riedinger are not available in Szeged any more, but they can be found in Szabadka, at least those plans about public lighting, and the *Gasbeleuchtungs-Rajon mit röhren und Laternen* [Gas Lighting Outline with Pipes and Lamps], on which the stamp of the entrepreneur can also be seen,<sup>12</sup> presents even two plans.<sup>13</sup> The plan, which was actually realised, was the “*Ground-Plan on the Streets of Szabadka Free Royal City to be Lighted by Gas*”.<sup>14</sup> In the bigger cities, at the beginning of the 20<sup>th</sup> century, long-term plans were made to develop public lighting. The Chief Engineer of Szeged made the overview map “*The Development of Public Lighting of Szeged Free Royal City*”, in 1909.<sup>15</sup> Three years later, the owner of the gas works submitted a proposal on the general development of gas lighting in the streets of Szeged based on that map.<sup>16</sup> Also, in Szabadka, the director of the gas works created the “*Public Gas Lighting Plan of Szabadka Free Royal City*”.<sup>17</sup>

*“Lighting of our cities is one of the most urging requirements in our civilised century; In the Western countries, even the villages have the necessary lighting, while, in our country, there is still much to do in this respect, but we are happy to see that our smaller towns and villages make big efforts, even sacrificing things, to advance.”*<sup>18</sup>

In the 19<sup>th</sup> century, lighting was one of the features of a city. In the first half of the century, occurrence of street lighting did not mean that the city

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<sup>11</sup> In Kecskemét, public lighting was supervised by the police. Each month they made a list about how the street lamps lighted.

<sup>12</sup> Maschinen und Gasapparatenfabrik L. A. Riedinger Augsburg

<sup>13</sup> SzTL F:002. 14021/polg. 1886

<sup>14</sup> U. o.

<sup>15</sup> CsML XV. 1. T 97.

<sup>16</sup> CSML XI. 39. – 1. d.

<sup>17</sup> SzTL F: 3-1-1-13

<sup>18</sup> Bácskai ellenőr, 1884. nov. 30. 1.

had a free royal status, but it suggested that it was a developing and rich city, which could afford such a luxury. In the second half of the 19<sup>th</sup> century, a process started and the result of that process was that all of the cities made efforts not only to introduce but to continuously develop its public lighting. After re-arranging the legal status of the cities, for places that were now in a lower category, lighting was a symbol of retaining the identity of a city, to make a difference from the villages, because, at the beginning of the 20<sup>th</sup> century, most of the villages still did not have street lighting.

In the 19<sup>th</sup> century and in the age of dualism, public lighting did not only have weekdays, but also holidays: illumination and ornamental lights. When there was a special occasion, happiness, or on days of state celebration, all citizens were obliged to light their houses in some way. The poor ones only placed a candle in the window, but the rich citizens decorated the whole house, hanging signs, carpets, pictures, etc.

In the 19<sup>th</sup> century, the development of lighting materials, instruments, and lamps resulted that a whole city could be lighted. So, public lighting became democratic, being available for all citizens of the city.

In the year of the Compromise, the main points of public lighting were formulated as follows, in a lamp request in Szabadka:

*“The public lighting of streets in the cities and other places, which has gained such a great popularity all over Europe, is a benefit for the public, but is also a burden, so, the way that all have to duly contribute to the public good proportionally is not only reasonable and desirable, but is also an unquestionable truth that all shall take his share in the burden – so shall all take his share in the benefit, or at least the majority of all, in an indirect way, if not in a direct way.”*<sup>19</sup>

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<sup>19</sup> Lamp request of Josef Tikviczky, city committee member; SzTL F: 002. 3720/polg. 1867

#### IV. List of publications concerning the subject matter of the dissertation

- „Világít nekünk Singer olcsón és jól” I., Szabadka „conservativ fényei”, In: Bácsország, 2005/2. 57-59.
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- A Szabadkai villamos és világítási részvénytársaság első éve, In: Ex Pannonia 2007/11. 56-67.
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- Régi nyomtatványok Szabadka történelméből, Kiegészítések a Szabadka bibliográfiája című könyvhöz, In: Ex Pannonia 2009./12.-13. 22-32.