

The culture of the modern world involves a sizeable and continuous use of energy. The story of energy as a part of modernity begins in the early 19th Century with hard work, experiments and the establishment of local energy systems. The natural conditions made certain by the alternation between light and dark, between warmth and cold, was gradually suspended by the introduction of electric lighting and heating into the home.

The welfare state has significantly hastened this development to the degree that notions such as wellness and individual well-being have become natural elements of our consumer culture and our daily life. In most parts of the world we have light whenever we desire it, and the homes maintain a comfortable temperature of 21 degrees Celsius by use of either heating or of air-conditioning.

In *The Culture of Energy* historians, social scientists and architects focus on various aspects of the energy culture in Western Europe, the United States, India and former Soviet Union, and examine subjects such as the history of lighting, street lighting, heating and central heating, household uses of energy, the debate on nuclear power, energy conservation and environmental perspectives on energy.

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Mogens Rüdiger

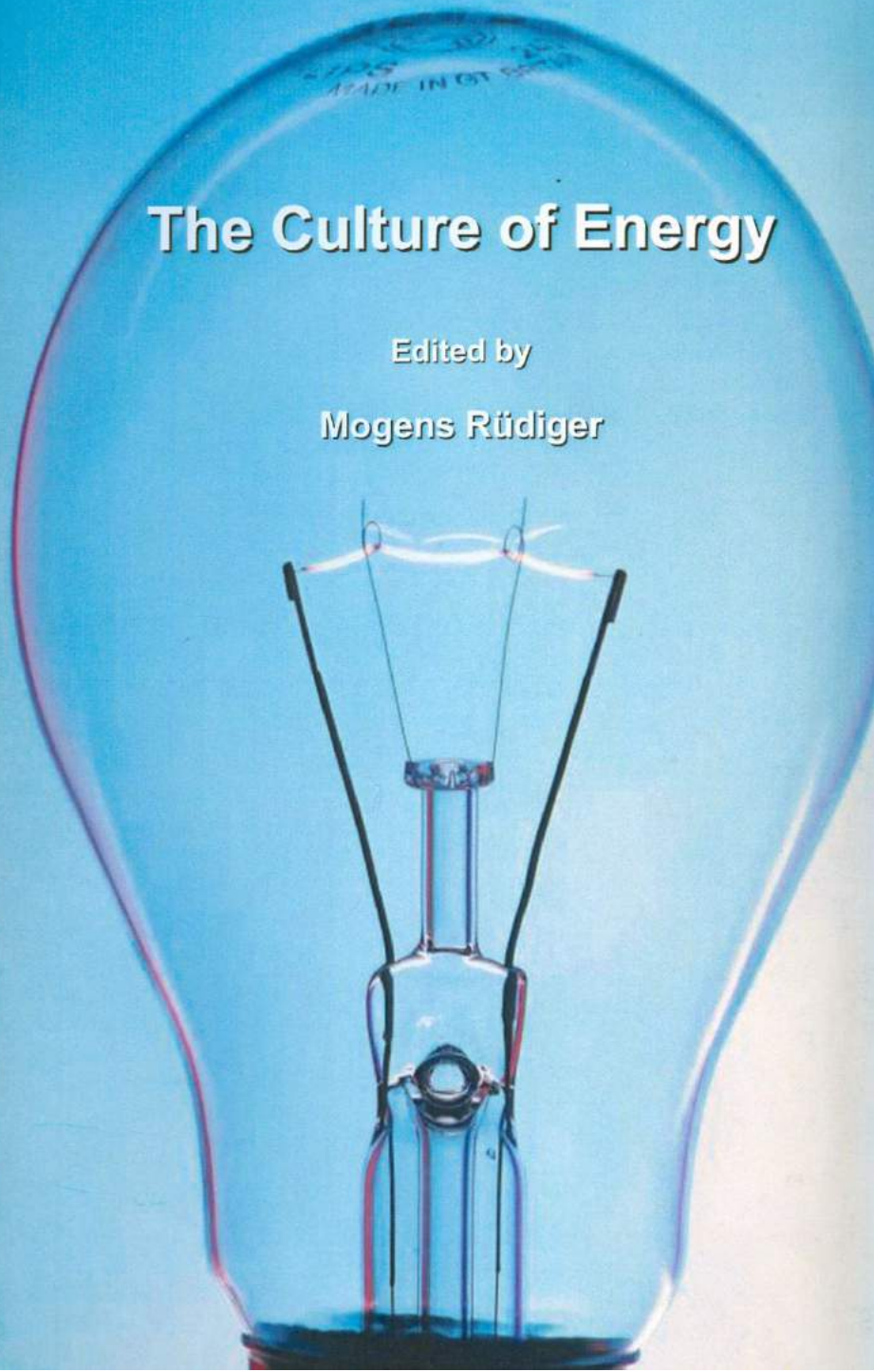
THE CULTURE OF ENERGY

CSP

# The Culture of Energy

Edited by

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## INTRODUCTION

### MOGENS RÜDIGER

Energy is a hot issue these days. Primarily, this is because it is at the top of the list of concerns over the climate and the environment, the supply security, the price and economic growth. This is with good reason. Energy is an indispensable element in modern life, and if we look at the period after World War II, energy has increasingly become an essential part of everyday life. It has become one of the raw materials of human life, not the only one, but one of the most important.

Everyday life is unthinkable without energy. From the electric toothbrush's first oscillating motion to the bedside lamp's last ray of light, our life is based on energy use. Almost every activity we pursue during the day, on our way to work, at work, in the home or related to leisure - the activity presupposes energy use.

The culture of the modern world involves sizeable and continuous consumption of energy. Like most technology, energy use suspends some of the natural conditions of existence. The alteration between warmth and cold, between light and dark, has been suspended by the introduction of reliable heating and electric lighting in buildings. In most parts of the world, we have a light whenever we desire it, and the buildings maintain a comfortable temperature of 21 degrees Celsius by use of either heating or air-conditioning. The welfare state has significantly sped up this development to a degree that notions such as wellness and individual well-being have become natural elements of our consumer culture.

The modern understanding of energy emerged with the industrial society. The first industrial revolution was indeed revolutionary exactly because in the production of goods and when mechanical energy replaced animal and human energy. Since the middle of the 19<sup>th</sup> century, modern energy found its way to other parts of society, to transport, the household, etc. In most – but not all – places, the gas light triumphed as the street light and the old natural oil lamps disappeared because of the brighter and safer light from



the new lamps. As time passed, when the product was improved and the price became reasonable, the electric bulb was gradually the preferred choice. The city and the home became enlightened.

From the very beginning, the exploitation of gas and electricity were separate from the production of energy and from the use of energy in private households and industry. Production and consumption of energy was slowly but surely separated and, in short, replaced by a structure in which production was located in the public sphere, while consumption remained in the private sphere. The introduction of district heating was somewhat later and a significant step in this process. After that, energy use turned into a question of pushing a button or turning a valve. Oil and gas-fired central heating was, in a way, an exception to these changes because the production and the use of heat takes place under the same roof and the user does not need to make any effort on a daily basis.

At the same time as energy has grown into a more indispensable element in modern life, to the individual human being it has lost its materiality. This is a consequence of the centralisation of production at power stations, at the combined heat and power stations, and at nuclear power plants. Subsequently, the word 'energy' has become a symbol of the fact that we no longer have a direct connection to the value of fuels, but only to energy using instruments or appliances in manufacturing facilities, in households and on highways as well.

The disappearance of the present materiality of the fuels (wood, coke, coal, etc.) in favour of the absent materiality of energy, firmly indicates that a scientifically-based conception of the universe of energy requires more than an understanding of the technology-based improvement of everyday life and the technical and the economic sciences' quests for optimizing energy efficiency in production and consumption. We also need to address and explore the cultural contexts in which the daily turnings on and off of power and heat take place, if we want to reach a complex understanding of energy's role in modern societies. In other words, an understanding which not only focuses on the technological, political or economic aspects, but combines those perspectives with a thorough historical analysis of cultural contexts.

Overall, the purpose of this collection is to contribute to a more profound understanding of cultural perspectives on energy. It presents a number of

inspiring studies in contexts of cultural and energy since the 1850s. It is divided into four parts.

Part I, "Energy and the City" focuses on the breakthrough of modern energy as a result of the introduction of placing lights in the city, which included both the evening and the night. The study of artificial illumination of the city and the architecture of light, as well as electrical buildings and the architectural visions behind them, also illustrates this historical process.

The chapters in Part II, "Spending and Saving" discuss considerations on various parameters related to the production of energy, especially efficiency and environmental concerns. Since World War II, nuclear power has influenced the notion of energy, primarily the popular notion, and has been an important topic in ongoing public debates on energy. Since the early 1970s, the possibility of an energy crisis has been apparent and the public as well as the political responses to the first oil crisis, for example conservation or changes in the energy mix, forms another essential issue in the history of energy in modern society.

Part III, "Energy and Home" addresses how energy is used in the home and in the household, which automatically includes casting light on the role of a housewife, her role as the family's fixed-point and as the bearer of modernity in the family in the 1950s and 1960s, for example by the use of electric appliances. The attitudes toward energy among common people have changed since then, but a study of practice shows that energy saving is a far more difficult process than 'good ole' modernisation.

In Part IV, "Heating and Lighting" the focus is on historical changes in the heating of buildings and on the introduction of central heating as a prerequisite for improving the milieu in homes and furthering a more casual life style. The same goes for lighting because correct and aesthetically balanced light is crucial for improving the quality of life – the main purpose of energy.

The contributions in this publication were first presented at the conference on "Energy and Culture" in Esbjerg, Denmark from 6-8 February 2006.

The conference was organised by members from the Centre for Energy and Society:

Hanne Thomsen (The Gas Museum, Hobro);  
Flemming Petersen (Danish Museum of Electricity, Bjerringbro);  
Morten Hahn-Pedersen (The Fisheries and Maritime Museum, Esbjerg);  
Soren Federspiel (Copenhagen Business School), and  
Mogens Rüdiger (Aalborg University).

*Copenhagen May 2008*

## ENERGY AND THE CITY

## GAS-LIGHT IN ITALY BETWEEN 1700S & 1800S: A HISTORY OF LIGHTING

DAVIDE DEL CURTO AND ANGELO LANDI

During 18<sup>th</sup> century, cities were still afraid of night: at sunset the town gates were closed and so were the doors to the houses. After curfew, armed units patrolled the streets by the light of torches in an atmosphere that is hard to imagine today.<sup>1</sup>

Public lighting in London relied on house owners who put oil-lamps at their front doors. It was only in 1736 that a reform divided the city into districts whose lighting was taken care of by small corporations.<sup>2</sup>

In the late seventeenth century France, the absolutist state disposed the use of public lanterns to light the streets, giving birth to the first attempt at urban lighting. The police were entrusted with the control and maintenance of this very simple means of lighting. Lamps offered better safety guarantees while the lampposts were considered a routine symbol for a long time as and breaking one of them was considered as a rebellious act: lighting was, above all, a question of public order.

Lanterns were made of a glass and an iron box. A candle was lit inside the box and hung from a rope across the street. Antoine Lavoisier made experiments in order to regulate street-lamps - called *revêrbère* - with multiple oil wicks and internal surfaces reflecting light downwards and sideways. It improved the lighting efficiency of the street-lamps, but was unable to provide positive results on the overall lighting situation.

<sup>1</sup> We are much thankful to the organizers of the CES Conference and to all the participants. Particularly useful were the conversations with Emmanuelle Gallo, Olivier Namiais and with Bruno Cordovil.

<sup>2</sup> Schivelbusch Wolfgang, (1983), *Lichtblicke. Zur Geschichte der künstlichen Helligkeit im 19. Jahrhundert*, Carl Hanser Verlag, Monaco.

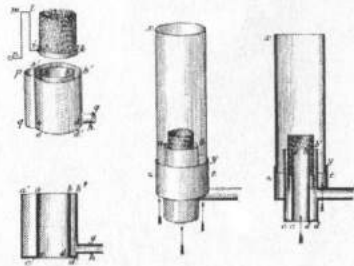


1. During 18<sup>th</sup> century armed units still patrolled the streets by the light of torches.

Availing himself of Lavoisier's experiments, in 1783 Ami Argand<sup>3</sup> presented an innovative oil lamp in Paris. A flat, tubular-shape section wick was substituted for the traditional candlewick and improved the lighting efficiency of the traditional combustible material. The Argand lamp appeared prior to the gas lamp and forecast the combustion procedure based on the mixture made of oxygen and combustible material.

Another improvement was attributed to the glass cylinder, which protected the flame from drafts thus improving its combustion, the vent due to the "flue effect" and consequently its efficiency.

<sup>3</sup> Argand was born in Genève in 1755 and moved to London where he registered the patent for his lamp in 1784. Cf. *Ami Argand à Versoix, histoire et archéologie d'un site industriel*, (décembre 1999), Direction du patrimoine et de sites, République et Canton de Genève.



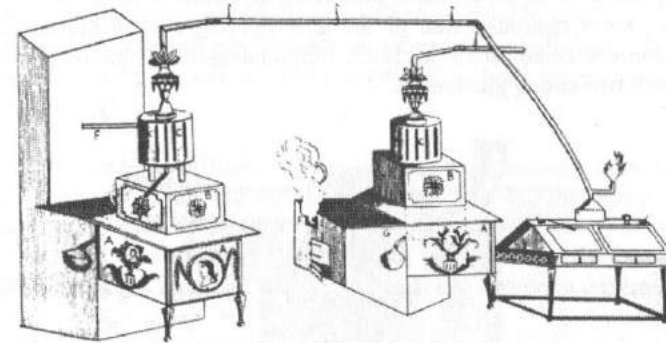
2. Scheme of an air flow lamp. Eugène Péclet, *Traité de l'éclairage*, 1827.

Besides these, Argand proposed a further device that made it possible to drive the wick up and down, regulating the flow of the oil to the flame and therefore, its intensity. Argand achieved very positive results in the process of flame regulation, even if this was still tied to the traditional system using oil.

At the end of 18<sup>th</sup> century, industrial development awakened a new interest toward new and more suitable sources than candles and oil, to guarantee the production inside the factories.

At the very beginning of the 19<sup>th</sup> century in France, Philippe Lebon<sup>4</sup> employed a coal-gas mixture obtained by distilling wood for his project called "*Thermolamp*," a type of big stove that was able to produce warmth and light simultaneously. Lebon's "Thermolamp" matched the two main uses of energy in the houses – warmth and light - and it reached both the conservative and innovative aims of a self-produced energy. Furthermore, its domestic pipe network anticipated the following and wider applications of the same system.

<sup>4</sup> Philippe Lebon (1767-1804), engineer at the *Service de Ponts e Chaussées*.



3. Scheme of a Lebon's Thermolamp composed by two distiller. (T.M. Daisenberger, cit.)

During October 1801, Lebon tried to demonstrate his ideas by illuminating the Hotel Seignelay in Paris but he was unsuccessful.<sup>5</sup> Lebon's invention was short-lived and did not overtake the first experimental level: the warmth produced was tiresome during summertime and the general functioning was complicated and onerous. Furthermore the problems linked with the distillation and with the combustible supply which the Thermolamp wanted to concentrate in the same apparatus, started to be solved by distilling coal industrially a few years later in England.

The coal-gas blend is a by-product of distilled coal and has been employed to illuminate factories in England since the 18<sup>th</sup> century. Coal-gas was originally employed to illuminate wide industrial spaces. Then gas devices quickly improved and the gas blend started to be used to illuminate the interiors of the houses as well.

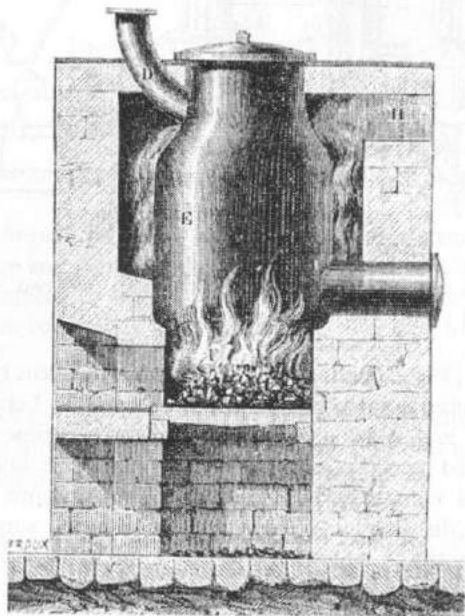
William Murdoch (1754 -1839),<sup>6</sup> a mechanical engineer at the Boulton and Watt Foundry in Soho-Birmingham, produced furnaces and steam-

<sup>5</sup> T.M. Daisenberger, (1802), *Beschreibung der daisenbergerschen Thermolampe*, Stadt am Hof.

<sup>6</sup> William Murdoch, (1808), "An Account of the Application of the Gas from Coal to Economical Purposes", in *Philosophical Transactions of the Royal Society of London*, Vol. 98, pp. 124-132.



power. Working in a highly productive and technological workshop he could carry out a lot of experiments producing gas from different kinds of coals.<sup>7</sup> He gave a demonstration of the new lighting system during the Peace of Amiens celebrations in 1802, illuminating the Boulton & Watt Foundry with two strong gas flames.<sup>8</sup>



4. Coal gas distillation retort.

Another Englishman, Frederick Winsor,<sup>9</sup> is considered the main person responsible for enlarging the system to an urban scale.<sup>10</sup> In 1806, he

<sup>7</sup> Samuel Clegg, employee at Boulton-Watt, perfected Murdoch's realizations setting a lime purification plant for the treatment of the crude gas; this crude gas impurity caused bad smells, pipages obstruction and corrosion.

<sup>8</sup> Murdoch had a support in Gregory Watt -James Watt's son -; he assisted in Paris at the Lebon's demonstration.

<sup>9</sup> Albrecht Friedrich Winzler (1763-1830) was born in Moravia and then moved to England, where he anglicized his surname in Winsor. He went to Britain before 1799 and three years later moved to France where he investigated the Lebon's "thermo-lamp" - patented in 1799 -. Later he came back to Britain where in 1807 lit one side of Pall Mall, London.

founded the National Light and Heat Company in London and next year he started to illuminate a small district of the city.<sup>11</sup> In 1819, he moved to Paris to build a system like the one he had planned in London.

Murdoch's first prototype became an urban-scale application extending the use of a coal-gas mixture to the city lighting, both for private and public employment.

On this point, the diffusion of gas-lighting was generally connected to the development of an industrial tissue both for the necessity to supply combustible and for the opportunities to sale by-products of the distillation (coke, ammoniac waters, tar). England was a leader in Europe for the diffusion of gas lighting followed by France, Belgium and Germany.<sup>12</sup>

Argand's lamp was used to light public buildings in Italy during 18<sup>th</sup> century. Since the beginning of 19<sup>th</sup> century, before the quick season of the arc-lamp, gas lighting had started to be widely employed to illuminate both single buildings and entire cities, especially in the North of the Country. The south of Italy was slower to accept this sort of novelties and gas lighting did not quickly spread in the southern towns. Also the old capitals, Rome and Naples, never reached the same levels of consumption as the northern towns, where modern productive industries fostered the diffusion of gas lighting.

It must be noticed that the political situation in Italy at the middle of 1800's was considerably different in comparison with other European countries, where an earlier settlement of central forms of government allowed to plan national programs of economic and industrial development. Italy had been composed by several little states before it got united in 1861 and the development of a real national industrialization in the newborn State began only after 1870's. This political background had

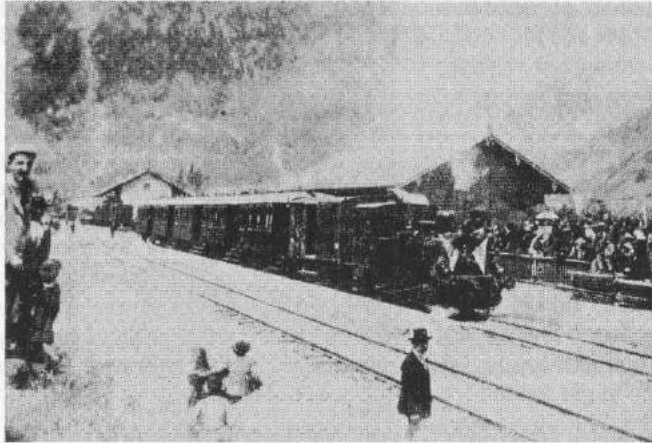
<sup>10</sup> "in order to supply our roads and houses of light and heat... as currently they are supplied with water", (Schivelbush W., op.cit.).

<sup>11</sup> In 1812 he obtained his first public assignment with his society "Gas Light and Coke Company".

<sup>12</sup> M.E. Falkus gives many data about the English situation and they help to better understand the spreading of Italian gas lighting. Almost all English cities having a population of more than 10000 inhabitants were illuminated by gaslight since 1826; towns with at least 2500 inhabitants had their own gas company since the middle of XIX<sup>th</sup> century. In M. E. Falkus, (Dec., 1967), "The British Gas Industry before 1850", in *The Economic History Review*, New Series, Vol. 20, No. 3, pp. 494-508.



surely affected to slacken the spreading of an industrial policy and, consequently, the diffusion of gas in all the little states which the Italian peninsula was divided in. They were characterized by different – and sometimes opposite – economic and political situations, most depending by local power.<sup>13</sup> Therefore the gas-light spread in Italy has been strongly influenced both by the political fragmentation both by the backwardness of its industrial development.



5. Both gas lighting and railway has transported the resources for the industrial economy.

This situation can be described taking a look to the dates when gas started to be used for public lighting in the main cities. In Piedmont, Tuscan and Lombard-Venetian State, the first towns were illuminated at the beginning of 1840's: Turin in 1838, Venice in 1842, Milan in 1845, Genoa in 1846.

In Venice, the first contract authorization for public lighting was signed on 30<sup>th</sup> November 1839 with a Lyonnais company founded by Giovanni De

<sup>13</sup> As an example, only in 1851, did the State of the Church allow installing gaslight in Rome because Pope Gregorio XVI had reserves about artificial light, considered subversive as far as the "divine conception" of day and night was concerned. Enrico Penati, (1972), *1837 luce a gas: una storia che comincia a Torino*, AEDA, Torino, p. 13.

Frigière,<sup>14</sup> De Saynes, Bonnardet e Rocher. Despite several technical problems the society began to illuminate the streets in January 1843 with 60 lamps.<sup>15</sup> After few months the number of lamps increased to 150, and in July 1847 it reached 500 public lamps and over 3000 private users. The gasworks was built, in the north-east part of the city<sup>16</sup>. Canals to be overtaken evidently represented one of the main difficulties to the spread of the gas network and during the restoration of the Rialto Bridge, pipes were placed under the new steps of the bridge, so gas could reach the neighbourhood of S. Polo, S. Croce, areas particularly needy of the new and plentiful light.<sup>17</sup>

The Venetian Region was truly one of the first to be interested by a wide spread of the gas-light: in 1845 Verona signed a first contract for public lighting with a French company and, at the end of the same year, the city was provided with 153 lamps for street lighting. Vicenza and Padua were equipped with a public light system in 1847, while Udine, due to a contractual quarrel, was lit in 1853.<sup>18</sup>

In Florence, the first gas company, called *Cottin-Jumel-Montgolfier-Bodin*, was founded on 2<sup>nd</sup> January 1839. The gasworks was built in the

<sup>14</sup> In 1837 Giovanni De Frigiére conducted the first experiment about public lighting in Naples, where he lit San Francesco di Paola Basilica. Cf. Silvana Bartoletto, (2000), "Gli esordi dell'industria del gas a Napoli 1837-1862", in *Ricerche storiche*, Edizioni scientifiche italiane, Firenze, pp. 569-82.

<sup>15</sup> In August 1843 "la Gran Piazza, Piazzetta e Mercerie [were illuminated] ed in qualche altra via principale, e contemporaneamente in alcuni fondachi delle mercerie suddette", Cf. Giulio Lecomte, (1848), *Venezia, o colpo d'occhio letterario, artistico, storico, poetico e pittoresco sui monumenti e curiosità di questa città*, tipi di Gio. Cecchini Editore, Venezia, p. 653.

<sup>16</sup> near Campo San Francesco della Vigna.

<sup>17</sup> "sotto i nuovi scaglioni [scalini, gradini] del Ponte i tubi conduttori del gaz, che da questa origine si dirameranno nelle contrade dei sestii di S. Polo, S. Croce, ... luoghi che maggiormente abbisognano di una luce viva e copiosa". Giulio Lecomte, (1848), *op. cit.*, p. 654.

<sup>18</sup> G. Sacchi, "Illuminazione a gas a Milano ed a Padova", in *Annali universali di statistica economia pubblica, geografia, storia, viaggi e commercio*, presso La Società degli Editori degli Annali Universali delle Scienze e delle Industrie, Milano, (April 1845, file 10), p. 97; "Illuminazione a gasse in varie città delle provincie venete", in *Annali universali di statistica economia pubblica, geografia, storia, viaggi e commercio*, (July 1847, file 37).

southern side of the river Arno<sup>19</sup> and gas began to be used for public lighting in September 1845.<sup>20</sup>



6. Galleria Vittorio Emanuele in Milano, arch. Giuseppe Mengoni, 1865-1877. (Archivio Fotografico AEM).

In Turin,<sup>21</sup> the old capital of the Kingdom called “Regno di Sardegna”, *Caffè Gianotti* had been lighted by gas since September 1823.<sup>22</sup> In 1837, the first private company *Ippolito Gautier and Francesco Reymondon* was instituted to produce and distribute gas.<sup>23</sup> However gas has been used for a permanent public lighting since the October 1<sup>st</sup> 1846, when 246 gas

<sup>19</sup> In 1845 the gas work was built between the “Torre Santa Rosa” and the “Porta di S. Frediano”, in a 7500 square meters area. In 1854 it increased its structure with a couple of new gasometers, and it reached a 15900 square meters area. Cf. E. Penati, op. cit., p. 163.

<sup>20</sup> Comunità di Firenze, (1854), *Contratto di accollo dell'illuminazione a gas della città di Firenze in estensione di quella esistente e di quella attualmente a olio*, Stamperia Granducale, Firenze.

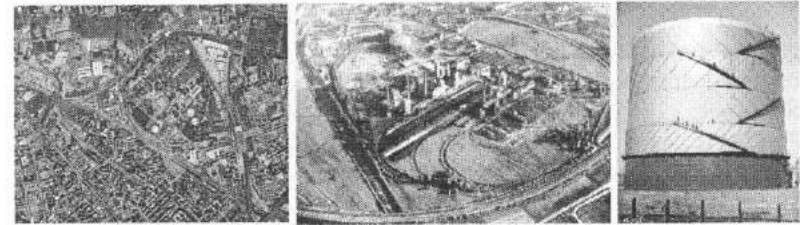
<sup>21</sup> Valerio Castronovo, Giuseppe Paletta, Renato Giannetti, Bruno Bottiglieri, (1987), *Dalla luce all'energia. Storia dell'Italgas*, Editori Laterza, Bari.

<sup>22</sup> Eng. Lana - responsible for the urban lighting in Turin and fireman chief - built a small plant to distillate oil and produce lighting gas and used this plant to illuminate the *Cafè Gianotti* since 1820. E. Penati, op. cit., p. 39.

<sup>23</sup> In 1851 a second company was founded in Turin, the *Società Anonima Piemontese per l'illuminazione a gaz in Torino*, established in Borgo Dora. It converged in a new company with existent society in 1856. In 1862 the *Società Anonima dei Consumatori del gaz luce di Torino* was established in Borgo Vanchiglia. Only in 1925 all the Turinese gas companies converged in a single company, called Italgas. Cf. Cerutti Renato, Gianeri Enrico, (1978), *L'officina del gas di Porta Nuova a Torino. La prima in Italia*, Società Italiana per il Gas, Torino.

lampposts were added to the 600 ones already existing and supplied with oil.<sup>24</sup>

The delay between the construction of the gasworks (1837) and the beginning of the public lighting service (1846) is due to the decision, taken in 1836 by the local administration, to postpone for ten years the expiry of the existing contract for the oil supplying.



7. Gasometer in Milano.

In 1887, while the first electrical lighting system was being tested, the number of gas lamps grew up to 4.000 and the oil lampposts were reduced to 300.

Genoa was the second city in the Sardinian Kingdom. Its inhabitants has maintained for a long time the habit of burning artificial oils such as paraffin, boghead oil<sup>25</sup> and, above all, the olive oil locally produced.<sup>26</sup>

<sup>24</sup> Oil lamps have been working in Turin since 1675. Oil was kept in use for long time to illuminate the streets because it was easily available and cheaper than gas. Cf. Mauro Barchielli, (1995), *La città dal buio alla luce*, Nuova Pratiche Editrice, Parma, p. 101.

<sup>25</sup> Boghead is a bituminous schist; artificial oil, petroleum or bituminous schist oil, were introduced in Genoa at the beginning of XIX century after the discovery of a natural schist field in the midland, near Amiano (Pr). The combustion of petroleum emitted smoke and acrid smell but it gave a very bright light. Petroleum was mixed with olive oil in equal parts in order to improve its smell and to save money. Cf. *Gazzetta Nazionale della Liguria*, year IV, n° 6, 24 July 1802.

<sup>26</sup> There is no detailed information about the definitive passage from oil lighting to that of gas in Genoa, the two systems coexisted for tens of years, so both olive oil and boghead oil continued to be used until the end of the century, when the first electrical appliances were invented. A license for the last lamps management, signed on 8 August 1861, states that in Genoa there were already 291 oil lamps to

Olive oil was very cheap in comparison with mineral oils charged with an import duty.<sup>27</sup> Lanterns and streetlamps were therefore supplied with about 16,000 kgs of olive oil from the Riviera Ligure and Sardinia.<sup>28</sup> The majority of the oil was used to illuminate the streets; the rest was consumed into the main public buildings such as the Town Hall in Strada Nuova, S. Lorenzo Cathedral and Palazzo Ducale.<sup>29</sup>

In 1843 the City Council allowed the “*Società per il gaz illuminante di Genova*” to build the gasworks<sup>30</sup> along the river Bisagno and a pipe-network to supply the first gas lamps near the railroad station and a few urban squares. A first public lighting system was established on the 5<sup>th</sup> September, 1846: 10 candelabras and 32 lamps were placed between Piazza Acquaverde and Piazza S. Domenico. A further concession<sup>31</sup> was signed five years later (1848) to extend the pipe-network in order to

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be adapted to boghead oil. ASCGe, *Amministrazione Municipale (1845-1860)*, file 1644, 8 August 1861.

<sup>27</sup> The Inspector of Urban Lighting was greatly interested in improving this material and he tried an experiment in order to compare the combustibles for “revèrbère” and gas lamps and found a relationship between the intensity of the flame and the consumption of oil (or petroleum). In 1852, four lamps – one and two flame lamps, one lamp with flat ribbon and the last fuelled with boghead oil – had been compared in order to choose the better one for lighting the city. Boghead oil lamp produced a double lighting intensity in comparison with the others; the flat ribbon lamp instead consumed less in relation to the lighting intensity produced. ASCGe, *Amministrazione Municipale (1845-1860)*, file 1644, 21 June 1862.

<sup>28</sup> Evidence of this can be read in supply contracts of the period: 18.000 olive oil kilos were enough to supply the Genoese post lamps for six months. They were bought for 100 new lire in that period, and their composition should not cause bad smells. Cf. ASCGe, *Amministrazione Municipale (1845-1860)*, file 1298, 29 November 1853.

<sup>29</sup> Public Administration early understood the importance of urban lighting and its connection with public safety; in 1849 oil lamps that did not work, were repainted and silvered. They needed also a frequent maintenance in order to remove wick encrustation and to clean the whole street lamp. Cf. ASCGe, *Amministrazione Municipale (1845-1860)*, file 1298, 29 November 1853.

<sup>30</sup> On the Sciallero property, in a place called “Consolazione Vecchia” along actual Via Canevari. That area measured over 8500 square metres Cf. “Officine del gas”. in *Comune di Genova: bollettino municipale*, year XIII, n°4, April 1933, p. 365.

<sup>31</sup> This contract – that lasted for 67 years! – set all particular aspects linked with the gas distribution, from the pipes instalment to the rule of importing combustible inside the town walls.

supply gas to the private citizens and to install a wider public lighting system.

Since 1857, the *Union des Gaz* started to provide gas for public lighting and began to manage the construction of a wider city pipe-line. This network greatly developed among private owners. In 1858 they bought about the 60 per cent of the whole gas produced. The gas network was quickly enlarged owing to the number of gas lamps which tripled between 1856 and 1863, whereas the number of oil lamps halved. In 1899, gas industries in Genoa were the most productive of Italy after those in Turin and Milan.<sup>32</sup>

CITIES	YEARLY CONSUMPTION (M <sup>3</sup> )	INHABITANTS	M <sup>3</sup> / INHABITANT
MILAN	25,000,000	406,592	61,49
TURIN	26,500,000	249,827	106,07
GENOA	20,400,000	206,088	98,99
ROME	13,500,000	437,419	30,86
NAPLES	9,415,000	481,500	19,55
FLORENCE	5,089,000	206,878	24,60
MESSINA	1,975,000	126,449	15,62

Vittorio Calzavara (1899), *L'industria del gaz illuminante*, Hoepli, Milano.

Since 1852, the oil lamps in Carlo Felice Theatre<sup>33</sup> were adapted to the new combustible. The 96 burners in the huge chandelier were adapted for

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<sup>32</sup> Transport prices for importing British coal, at first were favourable for Genoa in comparison with other Italian cities: in 1863 the cost for lighting a Genoese gas lamp was less than a half compared with a Turin one. Vittorio Calzavara, (1899), *L'industria del gaz illuminante*, Hoepli, Milano.

<sup>33</sup> Finished in 1826 it was planned by the architect Carlo Barabino (Ida Maria Botto (a cura di), (1986), *Il Teatro Carlo Felice di Genova: storia e progetti*, catalogo della Mostra presso le Sale didattiche di Palazzo Rosso e Palazzo Bianco, Genova, 22 febbraio-15 aprile 198, Genova, Sagep; Comune di Genova, (1955), *Il teatro comunale di Genova Carlo Felice: profilo storico dai primi progetti ottocenteschi... e la documentazione delle vicende amministrative promosse dalle civiche amministrazioni per giungere alla sua ricostruzione*.



the passage of gas,<sup>34</sup> and the lamps in the proscenium and in the orchestra, were also substituted.<sup>35</sup>



8. Galleria Mazzini in Genoa, 1873-1881. (ASCGe, file 1645)

Galleria Mazzini was built between 1874 and 1876,<sup>36</sup> next to the Carlo Felice Theatre. This arcade was built following the example of the main European galleries and was provided with a modern gas-lighting system. A big bronze chandelier lighted the cross, whereas bracket lamps lighted the sides of the aisles.

<sup>34</sup> Every burner consumed 180 gas litres an hour; the public lighting inspector set that in "3 hours and  $\frac{3}{4}$ " - a normal length for a play - the consumption should have been 68 cubic metres of gas.

<sup>35</sup> There were severe problems of functioning due to the poor gas quality and rudimentary technology in the distribution network of the building; these defects determined the substitution of pipes and burners of the pit chandelier by the Lighting Inspector.

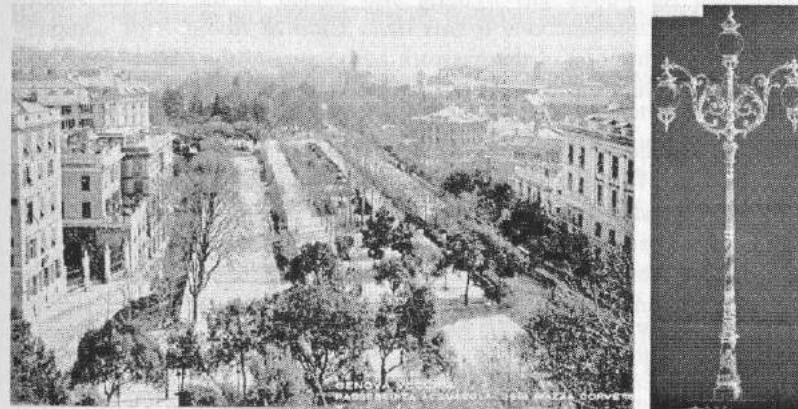
"il cattivissimo stato e l'ossidazione dei buchi per i quali esce il gaz in cattivissime condizioni di combustione, ed il cattivo sistema dei bracci in ghisa à cui sono otturati i becchi, attraversato da un tubo di ottone che facilmente si ostruisce dei depositi del gaz e per la sua forma ne è assai difficile la pulitura".

—SCGe, *Amministrazione Municipale (1845-1860)*, file 1287, 5 January 1859.

<sup>36</sup> ASCGe, *Amm. Mun. (1860-1910)*, file 1684: Galleria Mazzini (1873-1881).

In 1908, the Municipal Authority decided to substitute the gas lamps that had been illuminating the Acquasola City Gardens for over 40 years.<sup>37</sup> Regenerative gas wick lamps were chosen to replace the old lamps notwithstanding the electric network had already and greatly developed. They were made precious by candelabra, which were more suitable in preserving the 'old fashion' atmosphere of the gardens, where middle class families used to have a walk.<sup>38</sup>

Both in Turin and Genoa private gas companies invested capitals in the construction of a gasworks before they have obtained a concession for public lighting. In many cases, several years divided the construction of the gasworks from the moment when the City Council issued a concession for public lighting. Scarce private incomes sustained companies' balances before that moment and, after the establishment of a gasworks, many companies incurred debts and bankrupted.



9. Acquasola Gardens in Genoa, Carlo Barabino, 1845. (ASCGe, files 929 and 1552)

The industrial backwardness was confirmed also by the monopoly of Italian gasworks: these were built and managed by foreign societies, in particular French, Belgian and German which did not just bring assets to

<sup>37</sup> ASCGe, *Amm. Mun. (1860-1910)*, file 1552: Acquasola Gardens (1873-1909).

<sup>38</sup> These candelabra were produced by the continental company "J. Brunt & C.", placed in Milan. ASCGe, *Amm. Mun. (1860-1910)*, file 1552: Acquasola Gardens (1873-1909).

Italy, but also were supplied by a technical support: gasworks were built by foreign workers and managed by directors who were trained in foreign works.<sup>39</sup> Particularly the *Union des Gaz* was a true multinational company and operated mostly in the main northern cities like Milan, Genoa and Bologna.

The diffusion of gaslight was considerably delayed in the south of Italy where economy moved more slowly toward industrialisation and only the main cities were equipped with the new illumination system: Naples was lighted in 1840, Rome had the first gas-light installation in 1854, Palermo in 1861.

In Rome the political situation of the Papal States during 1850's and 1860's delayed the spread of gas-light. After the attempts by the *Fratelli Trouvè & C.* company in 1847<sup>40</sup> and by James Shepard<sup>41</sup> in 1852, the first concession for public gas lighting was issued to the *Società Anglo-Romana per l'Illuminazione a Gas della Città di Roma*. This company began the construction of the gaswork in the area of the Circo Massimo<sup>42</sup> and public lighting started on 1<sup>st</sup> January 1854.

In Bologna, the second city of the Papal States, the City Council established the first convention for public lighting on 22<sup>nd</sup> June 1846 with a society founded by the French bankers Enrico Saint Cyr, Adriano Trouvè, Edmondo Goldsmith and Giovanni Grafton. The gas company completed the construction of the gasworks in September 1847 and began to illuminate the streets during the same year. The City Council rescinded the contract in 1862 and a new contract for the lighting of the entire urban area was signed with the *Compagnia Ginevrina dell'Industria del Gas*.<sup>43</sup>

<sup>39</sup> AA.VV., *Dalla luce all'energia*, op. cit., p. 21.

<sup>40</sup> Pope Gregorio XVI died in 1846.

<sup>41</sup> He managed *The Imperial City of Rome and Italian Gas Light and Coke Company*. Cf. E. Penati, op. cit., p. 174.

<sup>42</sup> This gasworks, called "dei Cerchi", was built in 1853. On October 1871 a second gaswork was built in the northern side of the city, along Via Flaminia: it was called "del Popolo" and it could produce over 40000 cubic meters of gas in a day. Cf. E. Penati, op. cit., pp. 174-179.

<sup>43</sup> The new gasworks was built between "Porta S. Donato" and "Porta Mascarella" - in the northern side of the city, outside town wall -; it measured 14700 square meters. Archivio Storico del Comune di Genova (hereafter ASCGe), *Amministrazione Municipale (1860-1910)*, file 1844-3, pamphlet titled "*L'Officina del Gas di Bologna*" (settembre 1912).

Naples<sup>44</sup> was the first southern city to be lighted by public gas lamps: first attempts were carried out by the French Society *De Frigière-Cottin-Montgolfier-Bodin* as the one in the porch of S. Francesco di Paola on 10<sup>th</sup> September 1837. In 1840 they signed the first contract with the government and began the season of the street lighting. The precocity of the Neapolitan case remained an isolated event in the Two Sicily Kingdom: the first tests were conducted in Palermo in 1845 and a permanent public lighting system began to work only in 1861.

These dates are useful to refer the southern situation to the rest of Italy. Nevertheless, they probably do not allow to completely understanding the meaning of several "industrial primacies" reached by the southern kingdom at the beginning of 1840's. The construction of Pietrarsa mechanical works,<sup>45</sup> the suspended bridge on Garigliano River<sup>46</sup> and the first Italian railway draft, from Naples to Portici<sup>47</sup> must probably be considered as isolated events according to the lack of an industrial development and to an economy mainly founded on agriculture.

More in general, the Italian situation at the middle of 1800's could be described through a critical evaluation of the dates when a first public lighting system has been installed. These dates sometimes concern the making of a demonstrative implantation, such as the lighting of the main urban street, a square, an important public building. As an example, since

<sup>44</sup> Naples was the most densely-populated city in the Italian peninsula along XIXth century: in 1861 it was supposed to have 447.000 inhabitants. At the beginning of XXth century, they were 750.000 (Istat - Istituto Nazionale di Statistica, Roma).

<sup>45</sup> Pietrarsa mechanical works were built on a site called Pietra Bianca, between the rail Naples-Portici and the sea. On 22<sup>nd</sup> May 1843 Pietrarsa works were converted in maintenance and production of steam engines. AA.VV., (1990), *Da Pietrarsa a Pietrarsa. Storia e immagini del treno italiano*, Ente Ferrovie dello Stato, Roma.

<sup>46</sup> The "Real Ferdinando" bridge on the Garigliano River was projected by eng. Luigi Giura in 1828. In 1832 it was the first suspended bridge constructed in the continental Europe. Its components were supplied by Calabrian ironworks - owned by Carlo Filangeri - and its cost amounted to 75000 ducats. Cf. Carmine Antonio Lippi, (1817), *Ponte pensile pel Garigliano: natura de ponti pensili, ponti pensili puntellati i quali riescono i migliori sopra de fiumi grandi che gelano nell'inverno*, Napoli.

<sup>47</sup> On 3<sup>rd</sup> October 1839 the railway draft was inaugurated and it was 7.25 km long. In the first 40 days, the eight wagon train transported more than 85.000 persons. However it remained a local rail despite it had been extended to Castellamare in 1842 and to Pompei in 1844. Cf. Antonio Gamboni, Paolo Neri, (1987), *Napoli-Portici la prima ferrovia d'Italia*, Fausto Fiorentino Editrice, Napoli.



1864 the S. Andrea Basilica in Mantua has been lighted by a gas-light system which substituted the old oil lamps for the illumination of the nave and the dome.<sup>48</sup> This important installation was completed a few months after the construction of the town gasworks thus anticipating the following diffusion of the gas lighting throughout the town. This way, many early popular installations did not ever coincide with the construction of a civic gasworks and, consequently, with a wide diffusion of gas for private and public employment.

Otherwise, these dates testify the moment when a local administration granted the licence to award a public gas-lighting service. Local authority has kept this faculty for a long time influencing, this way, the effective diffusion of the implantation for public lighting both in the big cities both in the country towns. Gas has generally spread throughout the small towns rather gradually than in the big ones. As an example, the first gas-light system has been installed in Cremona during 1862<sup>49</sup> and in Mantua in 1864. Otherwise, the spread of gas-light was not directly related to the width of the urban centre or to the population density as demonstrated by Alessandria and Cuneo where a first gas system has been realized a few years later than Turin, during 1847 and 1849 respectively.<sup>50</sup>

In the end, the diffusion of gas-light in Italy was inconstant and not-linear way. Even if every city has its particular history, gas spread throughout the

<sup>48</sup> The S. Andrea Basilica in Mantua, a Renaissance masterpiece designed by Leon Battista Alberti and built in different stages from 1472 to 1765, when the wide dome designed by Filippo Juvarra, was finally completed. Since the second half of XIX century, as many other ancient building originally projected to be lighted by candles and oil, the Basilica has been equipped with a modern gas light device.

The base of the wide dome was equipped with a circular tube that provided a number of small gas burners able to light the great dome by the light of their flames. A double lighting system composed by a candelabra and a bracket lamp was applied at the base of responds.

The system was employed until the early 20s, but it provoked damages to the painted surfaces of the walls and frescoes. Today, they are completely covered with carbon sediment, a by-product of gas combustion. The gaslight installation also produced damages to portions of painted plasters and decorative stuccoes.

Archivio Storico Diocesano di Mantova, Basilica di Sant'Andrea collection, file 217-I, 18 May 1864 (gas light in the nave).

<sup>49</sup> Mauro Barchielli, (1998), *Luce: breve storia dell'illuminazione pubblica a Cremona*, AEM, Cremona.

<sup>50</sup> Both Provinces of the old Piedmont State

Italian cities according to a repetitive procedure, already tested across the Channel: first, early and desultory experiments were attempted in private buildings by rich and enterprising citizens (see what happened in Milan); after a few years, a private company was founded and allowed to supply gas for private uses; finally, the gas started to be employed for public-lighting, through the implantation of an initial local network growing, year by year, and through the construction of a town gasworks.<sup>51</sup>

Milan represented a special chapter in the history of gas lighting in Italy. The advanced position toward Europe make this city a sort of connection point between Europe and the rest of the Country.

Some Aristocratic innovators made early attempts to provide gas lighting in curious examples like Conte Porro Lambertenghi, an amateur physicist and inventor, who built a steam-power device near his spinning mill.<sup>52</sup> In 1818, Porro Palace in Milan was illuminated by plants bought directly in England at the Frederic Winsor factory<sup>53</sup> with some "original" distilled coke from Newcastle and an English mechanic to make them work properly. Silvio Pellico (1789-1854), the tutor of the Count's children, made the first Italian translation of *A Practical Treatise on Gas Lighting* by Frederick William Accum, published in Milan in 1817.<sup>54</sup> Pioneering applications of this system had been implemented by Giovanni Aldini<sup>55</sup> in 1820. He lighted the private theatre in via dell'Olmetto with the gas produced by a small oil distiller. This first experiment did not allow him to persuade the Austrian Administration to realize a gas plant to illuminate the "Teatro Regio alla Scala" as well.

<sup>51</sup> "Il gas illuminante a Milano", in *Il Politecnico - Repertorio di studj applicati alla prosperità e coltura sociale*, (1843), volume VI, printed by L. Di Giacomo Pirola, Milano, p. 485.

<sup>52</sup> Contiguous to Cassina Rizzardi home, near Fino Mornasco (Co).

<sup>53</sup> Silvio Pellico, (1835), *Le mie prigioni: memorie di Silvio Pellico da Saluzzo*, Baudry Libreria Europea, Parigi, p. 75.

The history of gas lighting is strictly connected with the early Risorgimento era, the most important season of political history in the so-called Modern Italy. Porro Palace in via dei Tre Monasteri (now via Monte di Pietà) was a meeting place for patriots like Silvio Pellico and Federico Confalonieri.

More about Silvio Pellico in Aldo A. Mola, (2005), *Silvio Pellico: carbonaro, cristiano e profeta della nuova Europa*, Bompiani, Milano.

<sup>54</sup> Friederich Christian Accum (1817), *Trattato pratico sopra il gas illuminante*, Italian translation by Silvio Pellico, F. Stella, Milano.

<sup>55</sup> Giovanni Aldini (1762-1834). His uncle was Luigi Galvani's (1737-1798).



Since the beginning of 1830's the Gaetano Brey's company began to distribute gas by the employment of gas cylinder in order to avoid the high costs for the pipe-laying.<sup>56</sup> In fact, pipe-lines demanded enormous capitals to be installed, even the half of the amount needed to build the entire gasworks, and only foreign societies were able to invest so much.<sup>57</sup>

The gas produced by the Brey's company was employed to illuminate the Galleria De Cristoforis since 1832 where gas lamps were installed beside twenty-eight traditional lamps supplied with oil.<sup>58</sup>

In June 1843, the Municipal Administration signed a tender contract with the Achille Guillard<sup>59</sup> Society giving it the task to build a factory for the production of gas.<sup>60</sup> After a few years, this factory included an 1850 mc gasometer, 48 furnaces distilling the coal imported from Newcastle and

<sup>56</sup> "Nuovo modo di ottenere il gaz per l'illuminazione introdotta in Lombardia dall'ing. Brey, e nuove lampade a gaz", in *Bullettino di notizie statistiche ed economiche italiane e straniere*, (May 1833, file 5), Società degli editori degli Annali Universali delle Scienze e delle Industrie, Milano, p. 213. Brey produced gas at home, in Via del Monte (now Via Montenapoleone). Mauro Barchielli, op. cit., p. 185.

<sup>57</sup> Cf. Valerio Castronovo in AA.VV., *Dalla luce all'energia*, op. cit.

<sup>58</sup> "Il passaggio delle ventotto lampade con specchi a riverbero, che si accendono in un salotto posto in fondo al secondo ramo della Galleria, e che per mezzo di un mulinello corrono lungo il tetto al posto loro in men di un minuto, va osservato dal Caffè, onde comprendere l'ingegnoso artificio che ha saputo vincere la difficoltà della voltata per passare al primo ramo; difficoltà che si manifesta da una leggerissima scossa che ogni lampada riceve nel momento della voltata". Cf. "Ragguaglio della Galleria De Cristoforis - aperta in Milano il giorno 29 Settembre 1832", in *Annali universali di statistica economia pubblica, geografia, storia, viaggi e commercio*, (July-August-September 1832, file 33), presso la Società degli Editori degli Annali Universali delle Scienze e dell'Industria, Milano, p. 287.

<sup>59</sup> As certified by notary Tommaso Grossi. His initiative was published in the *Il Politecnico* review; Carlo Cattaneo was one of the promoting partners of Guillard's company. Achille Guillard, "Dei vari modj d'illuminare e principalmente del nuovo metodo idrobituminoso", in *Il Politecnico*, (January 1839), Luigi di Giacomo Pirola ed., Milano, p. 9; Achille Guillard, "Delle varie materie dalle quali si può estrarre il gas illuminante", in *Il Politecnico*, (March 1839), Luigi di Giacomo Pirola ed., Milano, p. 225

<sup>60</sup> The new gaslight company already supported the warehouse in Contrada Clerici to store the oil employed for the public lighting. Cf. Bartolommeo Borroni, (1808), *Il forastiere in Milano*, Stamperia di Pasquale Agnelli, Milano, p. 181.

the bituminous schist extracted near Milan.<sup>61</sup> The factory was built outside the old town walls, near the Porta Lodovica quarter where the city was growing.

Public lighting was inaugurated on July 31<sup>st</sup>, 1845.<sup>62</sup> The network was composed of a 15 km long buried pipes and of 377 gas burners for streets lighting - placed 40 or 60 metres away from each other. Citizens living along the central streets such as Corso Monforte, Corso Venezia, Via Brera, and Via Larga had the possibility to connect their private houses to the gas network that supplied the public lampposts. However the high prices of gas limited its diffusion to rich middle class citizens and major shop keepers.<sup>63</sup>

Candelabras chosen for the public lighting were produced in England - even if they were designed by Italian artists - and they were placed in front of the law court (*Magistratura*) and in Corso di Porta Orientale. These candelabras made in England caused bitter criticism on behalf of the citizens, who compared the streets illuminated by them to cemetery paths.<sup>64</sup>

<sup>61</sup> Cf. Giovanni Frattini, (1856), *Storia e statistica della industria manifatturiera in Lombardia*, Tip. di G. Bernardoni, Milano, p. 212.

The gasometer was built by Filippo Taylor's company, from Marsiglia. Cf. Isidoro Calderoni, (1844), *La nuova illuminazione in Milano con il metodo per preparare il gas e servirsene esposto all'intelligenza di tutti*, Tamburini, Milano.

<sup>62</sup> Two years later than Venice. The Venetian plant was taken as model in order to avoid its technical problems to the gasometer and network. On 30 January 1843 Giovanni Rocher wrote on the *Gazzetta di Venezia*: "...l'evento ha consistito nella rottura del muro del perimetro al lato nord della vasca d'acqua, nella quale si tuffa il gazometro...[... the event consisted in a fissure on the wall of the gasometer, in the north side of the water bathtub...]". In *Annali universali di statistica economia pubblica, storia, viaggi e commercio*, (January-March 1843), vol. LXXV, Società degli Editori degli Annali Universali delle Scienze e dell'Industria, Milano, p. 84.

<sup>63</sup> In spite of high prices the gas company was hardly able to produce considerable benefits; in 1846 the supply service had been taken over by Jean Baptiste Roux. He also changed the company title in *Roux & C.* and renewed the agreement with the City Council in 1851, practising lower prices.

<sup>64</sup> Francesco Lampato, (1846), *Annali universali di statistica, economia pubblica, geografia, storia, viaggi e commercio*, volume VII della serie Seconda, presso la Società per la pubblicazione degli annali universali delle scienze e dell'industria, Milano, p. 92.

The National Library was lighted with gas in January 1861. At the same time, the Galleria Vittorio Emanuele, between Piazza Duomo and Piazza della Scala, was provided with gas lamps. The lamps at the top of the octagon at the cross of the Gallery were switched on and off by a small a sort of mechanical train called a *raton* (little mouse).<sup>65</sup>

In 1859 *Union des Gaz* took over the gas supply buying the three gasometers capable of 8000 cubic meters and a 50 km long network.<sup>66</sup> Towards 1867, gas lighting considerably developed and branched out through peripheral areas with more than 30,000 burners. The French company maintained its monopoly until 1920.<sup>67</sup>

The private consumption (8,000.000 cubic metres) exceeded public consumption (1,600.000 million cubic metres) in 1881 due to the growing heavy industry using gas to produce steam power.

After 1900, private and industrial gas consumption increased again and the pipe network covered the entire urban area. In 1905 over 91,500 gas metres were used by 550,000 inhabitants, and the distribution network developed along 300 km.<sup>68</sup>

<sup>65</sup> It was designed by Giuseppe Mengoni and it was built between 1865 and 1877. The octagonal plant is also described by Louis Figuier, (1888), *Meraviglie e conquiste delle scienze. Il gas e le sue applicazioni*, F.lli Treves, Milano.

About Giuseppe Mengoni and Galleria Vittorio Emanuele: Laura Gioeni, (1995), *L'affaire Mengoni: la piazza Duomo e la Galleria Vittorio Emanuele di Milano. I concorsi, la realizzazione, i restauri*, Guerini e Associati, Milano.

<sup>66</sup> The gasometers were situated in the St. Celso quarter. Cf. Giuseppe Sacchi, (1860), *Annali universali di statistica, economia pubblica, legislazione, storia, viaggi e commercio*, volume CXLII della serie Prima, presso la Società per la pubblicazione degli annali universali delle scienze e dell'industria, Milano, p. 440.

<sup>67</sup> In 1870 another company, the *Compagnia lombardo-veneta per la carbonizzazione dei fossili terziari* owned by Jean Jacques Guillet, obtained the exclusive right for supplying the Rail Station and to Comune dei Corpi Santi – in peripheral areas of the city – with gas. This society realized its own gasworks near Porta Nuova. In 1873 *Union des Gaz* incorporated the new company.

<sup>68</sup> Comune di Milano, (1905), *Relazione della commissione consiliare per l'esame dei dati tecnici sulla produzione del gas a Milano*, Tipografia Reggiani, Milano.

YEAR	BURNERS / GAS METER	GAS NETWORK (KM)
1845	377	15 KM
1867	30.000	-
1905	91.500	300 KM

The idea of social and political progress connected with the diffusion of a popular source of warmth and light involved the introduction of municipal gas companies to many towns. It was a sort of end-century movement known as “water and gas socialism” recognized by the law in 1903.<sup>69</sup>

The early signals of the crisis of gas-lighting occurred around 1883, showing the first attempts at using public electric lighting. The large use of Auer's incandescent gas mantle made it possible to greatly reduce the consumption and increase luminosity.<sup>70</sup> It consisted of one or more burners that, consuming a small quantity of gas, brought a metallic alloy wire (so-called “Auer”) to the incandescence. Its light originated from wire incandescence and gas combustion.

Incandescent lamps consumed up to a third more of gas than a traditional gas lamp, and also produced a more intense white light. This renovation contributed to keep gas competitive against the new (and still setting-up) electric technology.

<sup>69</sup> In La Spezia from 1877, in Como from 1894, in Padova and Vicenza from 1896.

<sup>70</sup> Auer von Welsbach – chemist and engineer – set up the first incandescent lamp in 1886.

In January 1890 the Civic engineer for Public Lighting in Genoa wrote about incandescent lamps:

“Accendendo nel modo usuale la lampada, la reticella diviene incandescente e produce una luce intensa fissa e bianca, quale è la luce di una lampada elettrica ad arco.[...] Da informazioni assunte risulta che dall'adozione di questo becco nella illuminazione di uffici di grandi ambienti si verificò una economia di oltre il 50% in detto consumo. [...] l'unico inconveniente che si presenta è l'estrema fragilità della reticella. Essa per un urto, per una scossa ricevuta dalla lampada cade e si frantuma, donde la necessità di sostituirla molto spesso con altre. E' per questa ragione che si ritiene difficoltosa la sua applicazione ai fanali stradali, mentre per le lampade nell'interno delle case non presenta difficoltà alcuna ed anche sarebbe vantaggioso ed economico il suo impiego.”

—ASCGe, *Amministrazione Municipale (1860-1910), file 1884, 20 January 1890.*



During the 20<sup>th</sup> century, the other main use for “town gas” gradually developed. It was employed as a practical and convenient source of power and heat. The way it has been obtained has changed in order to obtain make a combustible more suitable to produce heat than light. This new era in the gas production started with the construction of a new gas factory in the north-western part of Milan, the Bovisa district.<sup>71</sup>

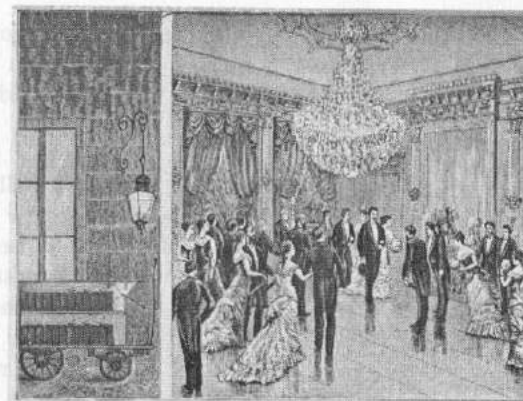
This area was to become a symbol of the industrialisation of the Milan and was placed near the city’s rail ring. The gasworks could produce 300,000 cubic metres of gas a day and has characterized the skyline of Milan for years.<sup>72</sup> In 1953 the gasworks was equipped with a new, bigger gasometer measuring 130,000 cubic metres.

Since 1981, the Municipal Electric Company has got the complete management over the network, and invested much money in order to pass from “manufactured gas” to “natural gas” or methane. This operation was complete in 1994, therefore it could be said that the history of gas lighting in Milan is quite short and lasted less than 150 years.

The history of gas lighting in Milan resumed and often anticipated what has happened elsewhere a few years later.

<sup>71</sup> About a history of Bovisa gas plant: AA.VV., (1941), *Tecnica del gas*, Hoepli, Milano, and AA.VV., (1986), *Energia a Milano*, edited by AEM, Milano [inside: Giancarlo Gaibelli, “L’avvento del gas” e di Pasquale Romano, “Al chiarore del gas: notizie tecniche e curiose”], Guido Barberis, (reprint 1991), “Aspetti economici e produttivi dell’illuminazione pubblica, dal gas all’elettricità”, in *Milano Luci della città*, (s.d.), edited by AEM, Milano; AA.VV., (1995), *Milano tra luce e calore*, edited by AEM, Milano.

<sup>72</sup> And it has now become the place of our faculty of Architecture and Engineering. Both State Railways and Milan Northern Railways availed themselves of Bovisa plants: they had been planned according the innovative standards in comparison with the old works in St.Celso. In 1934, St.Celso was definitively closed whereas after the Second World War the Bovisa plants were further developed and modernized; in 1953, a second gasometer of 130,000 cubic metres was built without any external pylon, and it was added to the others functioning since 1906. Another twin gasometer was built on the opposite part of the city (near Viale Forlanini). In 1931, the Edison Company bought the Bovisa works where the gas production from coal gas was definitively stopped in 1969.



10. New light sources for old interiors, Giuliano Lefèvre, *Dizionario illustrato di elettricità e magnetismo*, Milano Sonzogno 1893, p.17



11. Electric lamps came up beside and slowly replaced gas one.

Gas spread “step by step” throughout the other cities. First, demonstrative experiments inside stores or private palaces were often attempted with celebrative or spectacular purpose. Then, City Governments cared for gas lighting in order to improve public safety during the night. Grant authorizations were progressively awarded to private companies for the construction of the gasworks and, after that, for the installation of the pipe network to distribute the gas used for public lighting. These earliest uses of gas for public lighting were perceived by citizens mostly as an instrument to improve urban safety and decorum. At the same time, several palaces, churches – and also many private shops – had been illuminated with gas beyond public streets and squares. Many were



equipped with a gas system several years before the construction of a town gasworks. This progressive development of the gas network throughout the city made gas-light system to be perceived as an unavoidable public service.

Since 1900's gas had been slowly ousted by incandescent bulbs in public lighting due to better efficiency, power and safety of the new system. On the technical side, electric lighting borrowed from gas the idea of a distribution system separated from the place where the combustible (or the source of energy) has been produced and the one it has been consumed. Therefore, the swift success of electric lighting could be considered mainly as the improvement of an existing technology by the reduction of its defects.<sup>73</sup>

However gas had been progressively supplanted by electricity, it kept widely in use for long, sometimes until the end of the 1950's.<sup>74</sup> This was for a good number of reasons. Since 1890, the introduction of the Auer's mantle made the gas system more performing and the light brighter.

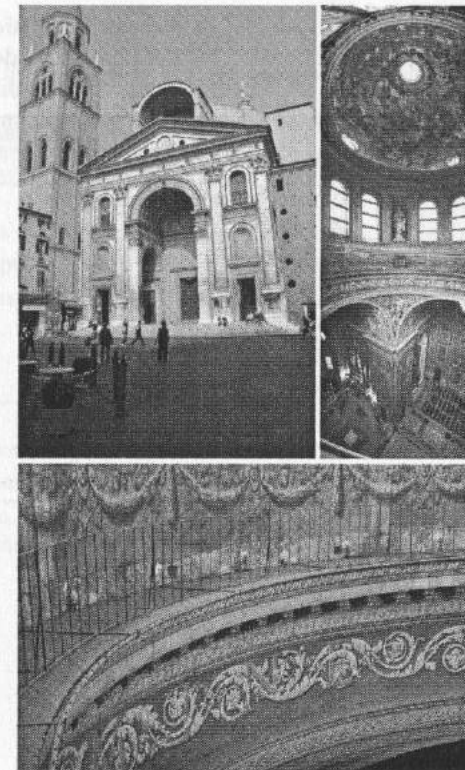
The very long-term contracts signed with Italian Public Administrations by the Gas Companies definitely were another reason because of the long survival of gas lighting after the diffusion of electricity. The length of this agreements and the strong determination of the companies to keep them effective, has maintained gas lighting in use even for 40 years after the technical and economic superiority of electricity has been proved.

Despite its apparent technological decline, gas consumption has generally raised during last century because of its increasing domestic and heating employment.<sup>75</sup> The gradual shift to a more calorific kind of gas induced the companies to adapt their networks to provide both industrial (motors) both home users (stoves and cookers).

<sup>73</sup> Schivelbusch W., *op. cit.*

<sup>74</sup> On 29<sup>th</sup> December 1933 the Genoese Podestà Carlo Bombrini (a sort of Fascist mayor) deliberated to implement public lighting. Gas lamps had to be substituted by incandescent bulbs. Actually some gas lamps survived until 1970's in the characteristic port of Boccadasse. Cf. "Il nuovo impianto dell'illuminazione pubblica", in *Comune di Genova: bollettino municipale*, year XV, n°3, March 1935, p. 201, and "La riforma dell'illuminazione", in *Comune di Genova: bollettino municipale*, year XV, n°11, November 1935, p. 677.

<sup>75</sup> ASCGe, *Amm. Mun. (1860-1910)*, file 1844-3, pamphlet titled "L'Officina del Gas di Bologna" (settembre 1912).



12. S. Andrea Basilica in Mantua: façade, transept and detail of the circular pipe provided with over 260 gas burners for the illumination of the dome.

This synthetic excursus over the development of gas lighting in Italy has tried to make a first synthesis of the existing studies about this topic. They are often episodic and characterized by a very local or technological point of view. The elements to write a history about gas lighting in Italy mostly come from social history and history of technology. The history of gas lighting represents a part of a more general history of the technical and social-economic development.

This inventory suggests a sequence of experiences developed by individual initiatives into several cities which, even if not-linear and sometimes heterogeneous, represents a first portray of the Italian situation since XIXth century. A History about objects (lamps, brackets,

candelabras) and about the private and public gas installations has yet to be written. Particularly, the relationship between the urban development of many Italian cities by the end of XIXth century and the diffusion of the gas lighting networks – both at the town scale, both at the single building scale - has yet to be studied.

### Appendix I

Statistics about the main Italian gaswork confirm the rise of consumption.

BOLOGNESE GASWORK (1867 – 1910)					
		1867	1894	1900	1910
Public lighting	m.c.	740.000	915.000	924.000	1.129.000
Public buildings	m.c.	30.000	75.000	67.000	213.000
Private consumption	m.c.	540.000	2.262.000	3.843.000	8.088.000
Gaswork consumption	m.c.	20.000	86.000	96.000	172.000
Dispersions	m.c.	(12%) 180.000	(7,5%) 270.000	(5,9%) 305.000	(7,1%) 736.000
<b>Total</b>	<b>m.c.</b>	<b>1.510.000</b>	<b>3.608.000</b>	<b>5.238.000</b>	<b>10.338.000</b>
N° of public flames	n°	1.534	1.932	2.068	2.787
N° of private flames	n°	8.054	26.965	51.604	108.530

Source: ASCGe, *Amm. Mun. (1860-1910)*, file 1844-3, "L'Officina del Gas di Bologna" (settembre 1912).