Ventilating and Heating Lariboisière Hospital, a Scientific Debate in Paris 1848-1878

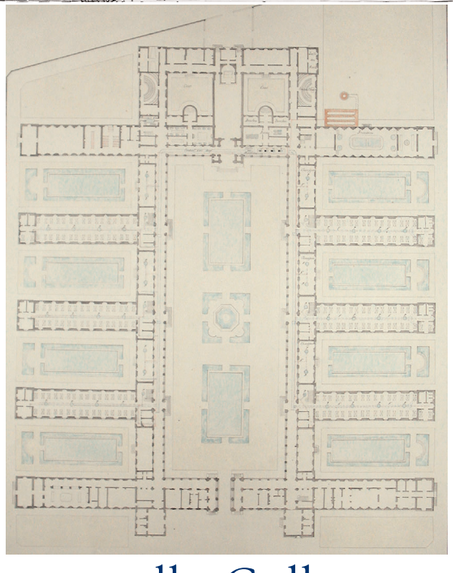
The Hospital:

The Lariboisière hospital was begun in 1846, thirteen years after it was decided to built a new hospital in the North of Paris, in dire need of such equipment. The area around the hospital was redesigned at the same time: with a new town hall, the Saint-Vincent-de-Paul church, and a covered market were built nearby. It's name changed several times before the opening in March 1854: Louis-Philippe, North or République. The name of the Comtesse Elisa Roy de la Riboisière was finally selected, on account of the large donation she made for its construction.

The general design was followed (Jacques-René, surgeon, 1724-1816) Tenon's ideals that "hospitals are tools or better machines to treat the sick". Thus the hospital had no, more than two stories, with large courtyards and distinct buildings. Its layout was influenced by the Navy Hospital built in Plymouth in 1762. The plan consisted of one large courtyard with a church marked the axis. On both sides, two-storey blocks were disposed. Covered corridors insured an efficient circulation. Each block contained three levels of thirty-two beds disposed in a large room and two additional beds in a smaller one.

The architect, Martin Pierre Gauthier (1790-1855), was trained by Charles Percier and Pierre-François-Léonard Fontaine, He had obtained the *Prix de Rome* in 1810 and taught at the *Ecole Polytechnique* in succession to J.N. L. Durand, was in charge of hospitals construction and renovations from 1820 to 1855.

With La Riboisière, the town and the *Conseil Général des Hôpitaux* intended to create an "exemplary" hospital for 600 patients. The building organization followed the latest conceptions in hospital architecture. Ventilation and heating equipment were particularly advanced.

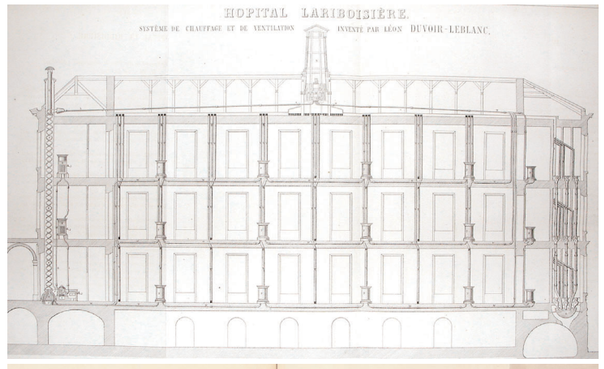


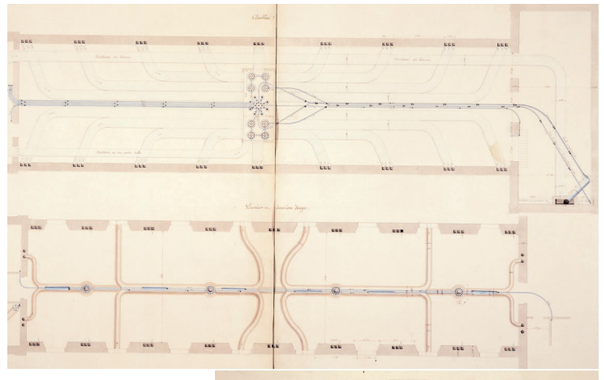
Emmanuelle Gallo

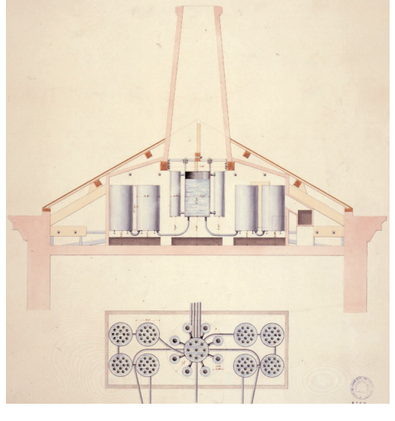
Architect, architectural historian, member of AVD research group,
Institut d'Art, Université de Paris I, Panthéon-Sorbonne
Dissertation in progress on the history of residential heating in France
emmanuellegallo@free.fr

Heating and ventilating the new hospital:

In the documents dated before 1848, the *Conseil Général des Hôpitaux* intended to use a Duvoir-Leblanc heating system. Such a system had been previously used, with good results, in older hospitals like Beaujon and Necker. But after the 1948 Revolution, the Conseil Général des Hôpitaux decided to organize a competition; it specified conditions: a uniform temperature of 15 degrees centigrade and 20 square meters of fresh air per hour for each bed. The engineers Grouvelle, Thomas and Laurens won the competition with the boiler builder Farcot. Their solution did not win general approval, however. The Conseil asked the general Arthur Morin (1795-1880), directing the *Ecole des Arts et Métiers*, with a solid experience in the study of heating and ventilation, to find a solution. He decided to divide the hospital into two parts: the men's section, one on the right was equipped with the Grouvelle system, the women's section, on the left, included the Duvoir-Leblanc system. This singular decision transformed the hospital into a kind of laboratory, where it was possible to experiment and measure *in situ*. It also generated a passionate debate on the heating and ventilation of hospitals. Behind the theoretical debate, however, remained the issue of which system would control the lucrative market of the heating and ventilation of public buildings.







The Duvoir-Leblanc system

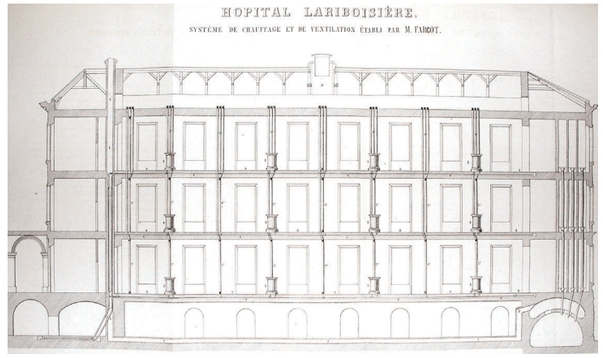
The two different systems:

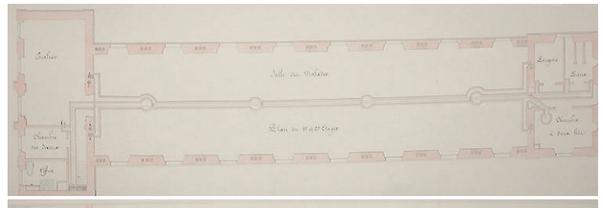
Heating by hot water with thermal ventilation (Duvoir-Leblanc)

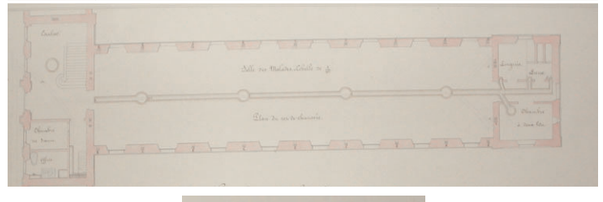
The Duvoir-Leblanc system consisted of a boiler situated on the ground floor. The hot water produced by the boiler was dispatched to a tank located in the attic. It was then distributed by pipes into four stoves (1,5 meters high and 0,79 meter diameter) disposed in each room. The water then returned to the boiler. The heating system took care of the ventilation. The air coming from the facade through ducts underneath the floor reached the stoves, where it was heated. It then rose by heat to the roof where it was expelled through an impressive chimney.

Heating by steam with mechanical ventilation (Grouvelle, Thomas and Laurens)

The Grouvelle, Thomas and Laurens system used steam to heat the buildings. The steam also activated a centrifugal fan for the ventilation. The steam, produced in another building (see illustration, colored in red), was send into the basement through insulated pipes. There, it reached stoves filled with water which collected the heat. The fresh air captured above the chapel was pushed into air ducts underneath the floor of the rooms, then through the stoves and then up into chimneys.







The Grouvelle, Thomas and Laurens system

The debate between protagonists:

Several engineers and physicians took positions in favor of one or both systems. Measurements and complicated calculations were used to demonstrate the superiority of one system over the other. Grassi, a chemist in La Riboisière hospital, devoted his thesis in medicine to the study of the ventilation and heating of the hospital. He maintained that both systems reached the requirements specified by the Conseil. He nevertheless gave his preference to Grouvelle, Thomas and Laurens on account of the superiority of mechanical ventilation in all seasons. He also found that the steam system be more reactive. The architect Gaultier de Claubry favored the Duvoir-Leblanc system, one which been used in several other buildings : the *Institut* and the *Palais de Justice* in Paris. Jean-Christian Boudin, a physician (1806-1866), rejected Grassi's opinions. He believed in the superiority of the Duvoir-Leblanc system for both heating and ventilation. The engineer Emile Trélat (1821-1907), a moderate, pointed out that both systems were equivalent regarding heating, but that the ventilation of the men's section was twice as efficient then the women's wings. Finally, the general Morin did not believed in the superiority of mechanical ventilation, on account of, bad smells in the men's blocks. He also preferred the hot water system. The steam system apparently demanded greater construction and maintenance costs than the hot water one, although there debates also raged on this topic.

According to contemporary witnesses, the women's wings equipped, with the Duvoir-Leblanc system, was especially cold on winter mornings. The surgeon Charles Perier confided that during his morning visits he often had to keep his coat on. This discomfort might have been the result of the maintenance workers' failure to activate the three different boilers in the early morning. Witnesses signal that Duvoir-Leblanc system appears to have blown out bad smells properly.

The abundant literature generated by the La Riboisière hospital is the sign of a highly experimental period during which engineers and physicians debated fiercely. Drawings on this topic in the *Portefeuille industriel* of the *Conservatoire National des Arts et Métiers* demonstrate the mid-nineteenth-century's keen interest in the heating and ventilation of hospitals.

Bibliography:

Jacques-René Tenon, *Mémoires sur les hôpitaux de Paris* (Paris, 1788).
Notice sur l'hôpital Lariboisière, ouvert à Paris en 1854 (Paris ,1863).
Dr C. Grassi, "Etude comparative des deux systèmes de chauffage et de ventilation établis à l'hôpital La Riboisière", *Annales d'hygiène publique et de médecine légale* (1856, p. 80).
Dr C. Grassi, *Etude comparative des deux systèmes de chauffage et de ventilation établis à l'hôpital Lariboisière* (Paris, 1864).
Dr C. Grassi, *Notices sur les travaux scientifiques du Dr. Grassi* (Paris, 1878).
Deschamps (d'Avallon) & H. A. Gaultier de Claubry, "Du chauffage et de la ventilation des édifices publics", *Annales d'hygiène publique et de médecine légale* (janvier 1853, pp.. 323-380).
Dr. Jean-Christian Boudin, "De la circulation de l'eau considérée comme moyen de chauffage et de ventilation des édifices publics", *Annales d'hygiène publique et de médecine légale* (1852, pp. 34-92).
Dr. Jean-Christian Boudin, "Nouvelles études sur le chauffage, la réfrigération et la ventilation des édifices publics", *Annales d'hygiène publique et de médecine légale* (janvier 1853, pp. 360-370).
Dr. Jean-Christian Boudin, "Chauffage et ventilation des hôpitaux; examen de quelques propositions renfermées dans la thèse de M. Grassi", *Annales d'hygiène publique et de médecine légale* (1856, pp.. 464-474).
Emile Trélat, Henri Peligot, *Examen comparatif des deux systèmes de chauffage et de ventilation établis à l'hôpital de Lariboisière* (Paris, 1864).
Général Arthur Jules Morin, *Rapport de la commission sur le chauffage et la ventilation du Palais de Justice* (Paris, 1860).
Dr. F. Guérard, *L'hôpital de Lariboisière* (Paris, 1888).
Jean-Paul Martineaud, *Histoire de l'hôpital Lariboisière ou le "Versailles de la Misère"* (Paris, 1998).
Dr. Pierre Vallery-Radot, *Nos hôpitaux parisiens, Un siècle d'histoire d'hospitalière* (Paris, 1948).
Nicolas Sainte Fare Garnot & Pierre Martel, *L'architecture hospitalière au XIXe siècle, l'exemple parisien* (Paris, 1988).
Bruno Foucart, "Au paradis des hygiénistes", *Monuments historiques*, n°. 114 (may 1981, pp.. 43-52).

Illustrations:

b&w drawing & picture Photothèque de l'Assistance Publique des Hôpitaux de Paris
Portefeuille industriel du Conservatoire National des Arts et Métiers, n°13571.1461 (1, 2, 3, 4) n° 13571.1591 (1,2,3).
b&w cuts in Général Morin, *Rapport de la commission sur le chauffage et la ventilation du Palais de Justice* (Paris, 1860)

Hôpital de Lariboisière.