

Technical Plants and Environmental Wellbeing in Milanese Noble Residences (1550-1650).

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Abstract: Renaissance treatises show how much their writers were sensitive to themes related to the salubrity of the environment in which people lived. Thus the question arises as to what provisions were made in this regard in the field of housing, focusing attention on technical plants and on a limited geographical and temporal area. The present study has investigated, with particular regard for the diffusion, construction techniques and costs, the features of the technical plants (supply of drinking water, collection and drainage of rain and waste water, latrines and cesspools, heating, bathrooms) that noble Milanese residences were equipped with in the period 1550-1650 so as to guarantee health and comfort, and what devices were suggested, and often adopted, to optimise the efficiency of these systems. The documents analysed have also shown how sensitivity to such matters was common ground, at least on the level of those who could afford to own a home.

INTRODUCTION

In *De re aedificatoria* Leon Battista Alberti recalled how *the ancients* were concerned that the environment in which they lived might be as "free of any sort of noxious element" as possible and, that since he thought that this precaution was "very wise and indispensable", he hoped that this aim might be pursued with "appropriate stratagems" (Alberti 1966, p. 24). A century later, Pellegrino Pellegrini thus concluded the chapter, entitled *Onde consiste l'arte dell'architetto* (What the art of the architect consists of), of his treatise: "All of this includes three things: comfort, health; [that the house] be as sturdy as it is perpetual; and that it be ornate, gracious and pleasant" (Pellegrini 1990, p. 71). Perhaps opening his list with the *comfort* and *health* of the construction is a reflection of Lombard pragmatism - he, in fact, was active for most of his career as an architect in Milan and the vicinity. Nevertheless, all Renaissance treatises dedicate a great deal of attention to themes inherent to those specific qualities.

The purpose of this analysis is to investigate, in light of the treatises and information on the subject available in studies carried out on buildings in other Italian cities, what "appropriate stratagems" were adopted in the numerous Milanese *case da nobile* built between the middle of the XVIth and the middle of the XVIIth century, so as to guarantee their salubrity, with special attention to heating systems, as well as systems for providing drinking water and for getting rid of waste water and fecal matter.

THE PLUMBING SYSTEM: STRUCTURE, MATERIALS AND COSTS

Wells to supply drinking water and sinks

In the Middle Ages, the water supply in Milan was only procured through a well system (Fantoni 1990, pp. 100-103), and in fact, in 1288 in his eulogy to Milan, Bonvesin da la Riva noted that in the city there were neither "cisterns nor water ducts that come from afar", nor were they necessary, since there was an extraordinary wealth of water that was "alive, natural, admirably well-suited for man to drink" and "so abundant that in every home with a minimum of decor there is always a source of running water, that is called a well" (Da la Riva 2006, p. 43). This type of supply continued to be used until the first half of the nineteenth century, when drinking water "was still drawn in the traditional way, from wells in the courtyards of the houses and brought up

by means of pumps or, more simply, by pails hoisted by winches". The depth of these wells varied between 5 and 15 metres, even if water-lines were already present at only 2 metres: in this way purer water was sought, thus minimizing the risk of infiltrations "of dirty matter" (Zocchi 2006, p. 160) from the numerous canals, ditches and streams on the surface.

Documentation found clearly shows how homes were generally equipped with wells in sixteenth-seventeenth century Milan: in purchase deeds and rental contracts, in fact, wells are almost always cited next to the main rooms, which means they were considered essential to the home. In smaller buildings there was usually a well in the courtyard, and at times it was shared with a neighbour, as happened in a small house with a workshop, next to the Palazzo dei Rossi di San Secondo, where there was a "well shared with the above mentioned most illustrious Count Troilo" in the courtyard (ASMi a), or in the Porro home acquired by Leonardo Spinola to expand his residence, there was "a well once shared with the above-mentioned magnificent buyer" (ASMi b). In residences, instead, there was more than one well, for example in the Palazzo Aliverti, one of the smallest of those analysed, there were "four wells" (ASMi c). Wells were generally located in the courtyards, more often than not in those connected to the stables or to the kitchens: in the Palazzo Medici in Via Brera, there was a well "under the portico in front of the stables for the mules" and another in the "women's courtyard" (ASMi d), while in Palazzo Mazenta a well located "in the small courtyard" is mentioned (ASMi e) and the kitchen opened out onto it. At times a well was also found in the garden, as in the Palazzo dei Torre in the Contrada dei Nobili. There was no lack of wells located in kitchens, or in the adjacent rooms where "dishes were washed" (ASMi f), and in the laundry rooms. At Palazzo Spinola there were, for example, "Fifteen cellars (...), two of which were destined for the laundry room with a fireplace, well and small brick stove" (BA a). In the documents analysed, wells located in transit spaces like loggias or passageways can also be cited: in Palazzo Cicogna, during the work carried out in the first decades of the seventeenth century, "a new well was built" in the new loggias (ASMi g), while at the Palazzo Medici there was a "passageway with a well" (ASMi h). In only one document, instead, a well is mentioned as being located "in the hall" (ASMi i). Wells could also be accessed from the first floor (*piano nobile*), and this was the case mainly when a second kitchen was located there: in Palazzo Spinola, for example, there were "two big kitchens, one on the ground floor, with (...) a well, sink (...), the other kitchen above, with a well, and a sink" (BA a). Wells, as suggested by the treatises, were thus located either in the courtyards or "near the Cellars, and other work areas of the home" (Scamozzi 1615, p. 346), that is to say, near those places where the presence of water was most useful to carry out the functions that those spaces were destined for (Fig. 1).



Figure 1: Wells in Milanese noble residences: Palazzo Landriani, the well in the courtyard (left); Palazzo Stampa Soncino, the well under the portico (middle) and Palazzo Cusani-Erba Odescalchi, the well at the first floor (right); (Beltrami et al. 1892, III, plate XLVIII and XLIV).

Besides the convenience of their location, in the treatises, attention is also given to the need for the quality of the water to be conserved. For this purpose, for example, it is noted that wells "should be in the shade" (Scamozzi 1615, p. 346); and, in fact, wells outside were always either located under a portico or equipped with a roof "to cover the well" (ASMi j) thus keeping also rainwater out, as is read in a description of the well of Palazzo Mazenta which was equipped with "wood-covered roofs for rainwater" (ASMi e). Or again it was recommended that wells be placed "far from any sort of garbage, and filth, (...), that might rot, or give bad qualities to the earth, or to the water" (Scamozzi 1615, p. 346). This problem was taken very seriously, as was the problem of avoiding infiltrations from cesspools, at times constructed too close to the wells, especially in smaller houses. An exemplary case is the fishmonger Pietro Martire Pensino, who in his home located in Porta Ticinese had a "fountain where he kept live fish to sell" and a latrine's cesspool (*vaso di necessario*) that was so

close to the fountain that sewage seeped in, killing the fish. He thus asked the appropriate authorities to let him build a new "*vaso di necessario* in the street and in front of his home" (ASCMi a).

The documents analysed do not contain precise descriptions of wells, but they do tell us what elements they were constituted of: "*tina* [pail], *canna* [shaft], stone sill, *tornello* [winch] and other things" (AOMMi a). The shaft was generally made of brick masonry and the treatise writers underline the need to build it so as to avoid infiltrations and so that the well could fill up only with the running water "that came from the bottom" (Pellegrini 1990, p. 274. At p. 275 he suggests building two concentric walls with the blind area full of sand). Little information has been found on dimensions. In one house of the Pozzo family in Porta Romana, for example, there was a well that was "11 1/2 *braccia* deep and 2 *braccia* wide" (ASMi k) (respectively 6.84 and 1.19 m; 1 *braccio*=0.594936 m). The well was completed by a *morena* (parapet), that could be of stone or in brick, at the Palazzo Medici of a thickness of 6 *once* (circa, ca., 30 cm; 1 *oncia*=4.9578 cm), and with a sill, generally in stone. In the majority of cases, the system of water extraction was formed of: the *tornello*, which hangs from the roof covering the well; the rope that runs through the winch and the pail attached to the rope by means of a *moia* (iron peg). The costs for building a well were: 30-40 *lire* in 1547 (ASMi l) – but the entries in this case also include the *acquarolo* (sink) annexed; 80-100 *lire* in 1567 (Soldini 2007, pp. 416-431); 60 *lire* in 1573-1574 (ASMi k and AOMMi b); 100 *lire* in 1604 (AOMMi a); 53 3/4 *lire* to build a shaft in 1623 (ASMi m). However, the data are not very helpful in that they do not contain information on the dimensions and on finishing. In order to have an economic reference from the construction milieu, it must be noted that the overall price for material and labour for brick masonry of a thickness of 9 *once* (ca. 45 cm) in the rough state was around 3 *lire* per m² in 1547, 4 *lire* per m² in 1573-74 and 5 *lire* per m² in 1604. In a description of 1617, rather than a winch, "iron arms to draw the water with" are mentioned (ASMi n), and seem to refer to a pump, in later documents also called a *tromba*. Thus the following could refer to a pump: "a lead *canna* (pipe) covered in wood for 8 *braccia* [4.75 m]" that completed the description of a well with "a winch without a rope" in the Palazzo Mazenta (ASMi e). Moreover, already in the 1580s-1590s, Lorenzo Binago in his *Formula* notes that one could use lead to make a "pump to draw it [water] from the bottom of the well upwards" (Repishti 1994, p. 113). The use of this mechanism – although rare – in the first half of the seventeenth century is also known in Genoa (Boato-Decri 1995, p. 62). The measurements of depth found, the 6.84 m of the well and the 4.75 of the *canna*, lead to the supposition that at the time the depth of Milanese wells did not go very far beyond 5 metres.

Next to the well, or in the same room in which it was found, there was also an *aquarolo*, or a *navello* (stone tub). For example, in a house situated in the parish of Santa Maria in Podone, there was "a well that served the kitchen and other places with its sink" (ASMi l), while in the Palazzo dei Torre in the Contrada dei Nobili there was "a stone tub to water the plants, and a well nearby" in the garden and "in the big courtyard to give the horses water, there is a stone tub, and a well" (ASMi n). The sinks were generally in stone, often *sarizzo*; they were supported by brick walls, and were equipped with a drain. The dimensions varied: lengths were between 2 1/2 and 3 1/2 *braccia* (ca. 1.50-2 m), and widths were between 1 1/4 and 1 3/4 *braccia* (ca. 0.74-1 m). The prices recorded for these elements including labour and materials vary, in the 1570s, between 3 1/2-4 *lire* and 20-40 *lire*, a gap that leads one to think of differences in dimensions, in materials and in formal characteristics. The drains of the sinks were made of special elements in brick with truncated cone shapes inserted into others, called *canoni*, that were built into the masonry. In the documents sizes are not specified, there are instead several indications concerning price: in 1586, 7 *soldi* (1 *soldo*=1/20 *lira*) were paid for a *canone*, 20 in 1608 and 12 in the 1660s.

Roof gutters and rainwater pipes

The proper management of rainwater was recognised as an important contribution to the health and comfort of the habitation. In this regard, Alberti observed that it was essential to "transport rain water far from the building so as to prevent the terrain upon which the building rests from becoming impregnated with humidity", and so the best architects acted in such a way as to "channel the rain water collected by the roof gutters through tubes" (Alberti 1966, p. 90), thus also preventing the water running off the roof towards the wall below from "raining on the wall and causing it to rot" (AOMMi c), and making the rooms in the house too damp because "with dampness the body has the tendency to waste away" (Alberti 1966, p. 34) (Fig. 2). The care that owners also took to keep rain water far from their homes is clearly borne witness to in pacts and agreements related to work to be done on adjacent buildings, where there were always careful indications aimed at preventing roof runoff water from going into courtyards, gardens or, in any event, neighbouring property. An exemplary case in this regard occurs in a document of agreements between Roberto Archinto and Gian Giacomo Medici, whose homes were adjacent to one another: Medici, who wanted to have work done on his home, was not permitted to "let any water into the house or in the garden of said Signor Roberto" (ASMi o), whether it drip from the roof, or came from gutters or rainwater pipes.

In Milanese residences, as Alberti suggested, rainwater was collected in gutters that completed the eaves of the roofs. They were usually made of wood, generally larch, or of copper, while in only two documents are "serizzo stone channels" cited (ASMi p e ASMi k). The wooden channels were thus made of larch boards that had to be "good and well-made" and "well-nailed" (AOMMi d and AOMMi a). They were then covered with pitch and equipped with water spouts in *tolla* (tin), or more rarely in copper, where water entered the rainwater pipes. Their cost varied from 4 1/2-6 to 10 *soldi* per *braccio* between 1565 and 1586, while in the first decades of the seventeenth century they were between 10-12 *soldi*. To cover them with pitch, 1 *braccio* needed about 1/2 *libbra* (1 *libbra*=0.326793 kg) of pitch, the cost of which varied from 3 to 4 *soldi* per *libbra* in the period 1565-1579, to become 5 *soldi* in 1608. Much more costly were copper channels, which were paid

for by weight: 1 *libbra* in 1586 cost 12 3/4 *soldi* and as an estimate one might think that 1 *braccio* of channel could weight around 6 *libbre* and hence cost around 76 *soldi*, almost eight times the price of a channel in wood. In order to hold these gutters in place, iron elements were used; called *staffe* or *rampini*, they were placed at a distance of 2 1/2-3 *braccia* (1.48-1.78 m) from each other. In the little documentary evidence we have on rainwater pipes, they were in copper: in the Casa Menocchio in Porta Tosa, for example, a "copper tube that took the water from the roof to the ground" was installed, but in his treatise Pellegrini states that they could also be made "of lead, of wood or of terracotta" (Pellegrini 1990, p. 86). (For further information on the prices of channels and metals in the period in question cfr. Giacomini 2005, pp. 743, 746-47, 754).

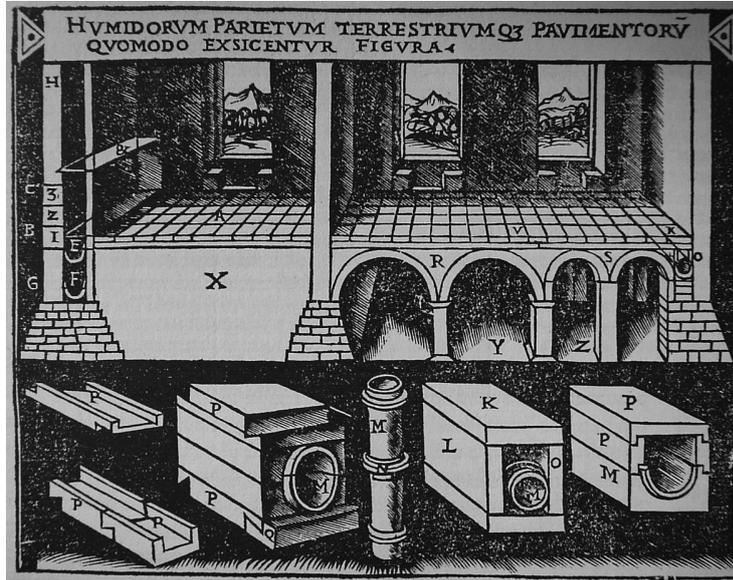


Figure 2: Cesare Cesariano, solutions to prevent humidity, conduits and pipes (*tuboli* or *canoni*); (Cesariano 1521, p. CXVlr).

Conduits and cisterns to collect and drain rain and waste water

Water from rainwater pipes and sinks was channelled through underground conduits (Fig. 2) to cisterns made for the purpose. For example, in the Aliverti's house for rent there were "conduits that served to route waste water and sewage from the sinks existing in the said rooms to the cistern existing on the same property (...) to collect such water" (ASMi q). The cisterns were sometimes connected to public sewers called *cantarane*, with further lengths of underground conduit. However, there were also cases – mainly for small, lower class dwellings – in which a conduit directly connected the drains to the *cantarana*, as happened in the house of Agosto Giussano in the via Rugabella, where there was not a "cistern, nor was it possible to construct one", and so for "the health of the house", permission was sought to be able to build an "underground conduit from the house to the *cantarana* nearby" (ASCMi b). In all cases, people sought to prevent "putrid matter, or other filth, except for rain and waste water" from going into these conduits (ASCMi c). There is a great deal of evidence that such care was taken, as can be seen from the fact that those who requested permission to build underground conduits emptying into the *cantarane* had to pay 6 *lire* if the conduit only contained rain and waste water, but instead 20 *lire* if it transported sewage from a latrine, for which permission was granted only in cases where it was impossible to build a cesspool: a document of 1589 states that Girolamo Pairana had to pay "for such permission (...) the sum of 20 *lire imperiali* one time because it was a latrine and not just water" (ASCMi d). On conduits which were also called *riali*, placed on private property there is little data. Generally they were constructed with side walls and floor in brick (at times specified: terracotta floor with bricks arranged edge-on), and they were covered with *vivo* (stone) slabs, or with brick vaults. The section varied according to necessity and with that the price varied, and was expressed in *braccio*: for example in 1588 a conduit of 4 by 5 once (ca. 20x25 cm) cost 18 *soldi* per *braccio*; for *riali* with unspecified dimensions 12 *soldi* were spent per *braccio* in 1589 and 20 *soldi* in 1617. The conduits were then equipped with inspection holes that made it possible to clean them. In permits related to conduits that concerned public property, there was an ordinance that in the part inside private property "a grate had to be kept over the mouth of the *riale*" (ASCMi c), that in the part under public property the vault had to be strong and constructed in masonry "of a size not less than three heads [ca. 45 cm]" and that the filling between the vault and street level had to be "well-beaten earth" (ASCMi d), so as to prevent the street pavement from caving in, and again that the conduit outlet be "lower down near the end of the Seveso so that it stay under that body of water and not cause ugliness or stench" (ASCMi e) (the eastern part of the main sewer ring was called Seveso, while the western part was called Nironone, and in general *cantarana*).

In the *case da nobile* cisterns were found underground in the courtyards or sometimes in the gardens. In bigger residences, there was often more than one, one big cistern and several additional ones. For example, in the Archinto houses in Contrada di Brera there was "a little cistern built in the court to collect the refuse from

the *acquarolo*, in addition to the big cistern" (ASMi r). Cisterns had a truncated cone shape with the narrower part at the top, and they were built in masonry and covered with a vault where the opening was covered with a stone. In some lists of work carried out, precise indications of size are given: for example in one of the Cusani's houses in the Contrada Visconti a "little cistern with a diameter 2 *braccia* wide at the bottom, and 1 1/2 *braccia* above that is deep net at least 2 1/2 *braccia*, made well, for waste water, covered with a square stone 2 *once* big" was built (ASMi s), while at the Palazzo Medici in the Contrada di Brera two little cisterns were built with the upper diameter equal to 3 *braccia* and the lower to 4 *braccia* (respectively 1.78 and 2.37 m). In the case of smaller, more humble dwellings, without courtyards or with very narrow courtyards, it was possible to obtain a permit to build cisterns located near the house, under public property, and for these constructions there were precise provisions: "walls and vault must be well-constructed with a thickness of three heads" (ASCMi f), a "*sarizzo* slab to cover its mouth" was used (ASCMi g), and the maximum diameter could not exceed 3-3 1/4 *braccia* (1.78-1.93 m). The depth in general was not specified. As far as prices were concerned, it is known that in 1583 excavations including cisterns cost "one *soldo* for each *quadretto*" (ASMi t) (1 *quadretto*=0.210578 m³). In the 1580s, too, a little cistern could cost, according to dimensions, about 9-40 *lire*, while in 1573 for a big cistern including its conduit, 50 *lire* were spent. Cisterns were periodically cleaned by people especially appointed to do the job. In 1587 to "clean out the cistern and taking away the material", 6 *lire* were spent (ASMi j).

In the requests of private citizens mentioned above, there is evidence of an across-the-board attention on the part of all social classes to the salubriousness of the house and urban décor. In fact, in many cases, it is stated that the construction of those conduits or cisterns might have brought "cleanliness to the city, and health to the inhabitants of the house and to their neighbours" (ASCMi h). An exemplary case is Caradosso Foppa. Since he owned, in his house located opposite the church of Santa Maria al Cerchio, a cistern located outside the gate "that was so small that it had to be continually emptied" causing "stench and bad odours" and bringing "indecent to that holy place", he asked if he might not connect the cistern to another conduit that already existed and emptied out into the main sewer channels through a conduit passing under the main street, "thus preventing the said filth from ruining the décor of the city". The same reasons of décor and salubriousness were pleaded by those citizens who made requests to be able to cover with brickwork vaults those stretches of the *cantarane* that were still uncovered, but that bordered on their dwellings or even passed through their lots, as happened for example with the Palazzo Acerbi in Corso di Porta Romana, where "in the garden in between his houses" the *cantarana* passed (ASCMi i), to Palazzo Visconti in Via Lanzone, where there was "a little courtyard, in which the bed of the Nirone passed" (ASMi u) and also in the house in Porta Vercellina of the Melzi, where the Nirone "passed through the vegetable garden" (ASCMi j). The main course of the urban sewer system was formed of those channels that "had once comprised the defence ditches of Roman and medieval Milan, that is, the Seveso and the Fossa Interna" (Gentile et al. 1990, p. 64). Although these channels were for the most part covered, there were still uncovered stretches between the sixteenth and seventeenth centuries that caused, especially in the summertime, "an intolerable pestilential stench", "intemperance in the air" and even "ugly views" because of the rubbish that flowed through it (ASCMi k e ASCMi l). The reference to a "pestilential stench" should not be considered a secondary factor "in a period when, among other things, people thought that bad odours could be carriers of disease" (Fantoni 1993, p. 44). This idea was widespread not only among the population, as is not only clearly expressed for example by Gio. Francesco della Torre who, in asking for a permit to cover a stretch of the *cantarana*, stated that it was "very important in order to keep the air healthy, and remedy the plagues that often come after similar putrid exhalations" (ASCMi l), but is also confirmed by the treatise writers: Pellegrini, for example, wrote that "the stench, above all in hot weather, would be intolerable and cause bad diseases" (Pellegrini 1990, p. 57).

The permit to cover stretches of the *cantarana*, whose bed was 4 1/2-6 *braccia* wide (ca. 2.70-3.50 m), was generally granted, but several conditions had to be met: the vault specially constructed for the purpose could not be of a "height inferior to 3 *braccia* above the surface of the water" so as not to stop the flow of water and rubbish "in very rainy weather" (ASCMi k), and it had to be built in *pietra cotta*, that is in brick, using "good material" so that it would be resistant. There also had to be "convenient and necessary mouths to sweep and to empty out the waste from the said *cantarana*" (ASCMi i), which had to be covered with "pieces of *sarizzo* stone that were visible, and easy to remove as needed" (ASCMi m).

Latrines and cesspools

The latrine was another service feature that, like wells, must have been considered as an important element for the quality of the home, since it too was always, or almost always, cited in the purchase deeds or rental contracts of houses and noble residences. It was identified with various terms: the most frequently used in the period in question was *necessario*, while in the documents dating from the fifteenth century and the first half of the sixteenth century *loco curiali* was in use. However, the terms *latrina*, *luocho comuno* and *cortes* were also used, although much more rarely.

Smaller houses generally had only one latrine, while in noble residences there was more than one. Toilets, according to what can be extrapolated from the documents analysed, were usually located on the ground floor or under the stairs, like at the Palazzo Medici and the Palazzo dei Torre, or they were very often located near the stables, sometimes with access through the courtyard or porticoes. Only in homes for rent or in inns were *necessari* cited as being located on the upper floors, for example in the Osteria dei due Pavoni there was one "at the top of the first staircase where the attic is" (ASMi v), while in a home for rent in Santo Stefano in Brolo there was one in "the first room towards the street" (ASCMi n). In only one case was a latrine cited as being at

the end of the garden (for a comparison of the location of toilets in Roman dwellings of the XVth and XVIth centuries, see: Pagliara 2000, pp. 67-74). In the houses of Milanese nobles, latrines were thus located on the ground floor, while it does not seem that there were privies reserved for members of the proprietor family located near the apartments on the *piano nobile*, as also appears to be confirmed by the fact that in the inventories, there are often listed in the bedrooms or adjacent rooms, *canteri da camera*, or close-stool, in wood. Peter Thornton has also shown that in the Italian Renaissance, nobles preferred these movable objects, but he adds that private privies could also take "the form of a fixed seat set in a niche or small closet", but it, too, was also equipped, like the close-stool, "with a removable pan, with a pierced seat that normally consisted of a padded ring, and a cover" (Thornton 1991, p. 245-249). Patricia Waddy also observes that in Roman noble residences of the seventeenth century, with the exception of the Palazzo Borghese, "there were no permanently constructed toilets in the major apartments of any of the palaces considered" (Waddy 1990, p. 51). And for that matter, Alberti, too, condemned the habit of putting "private latrines, receptacles of very harmful exhalations" in the home, above all "in the main rooms where we usually have a rest" (Alberti 1966, p. 430).

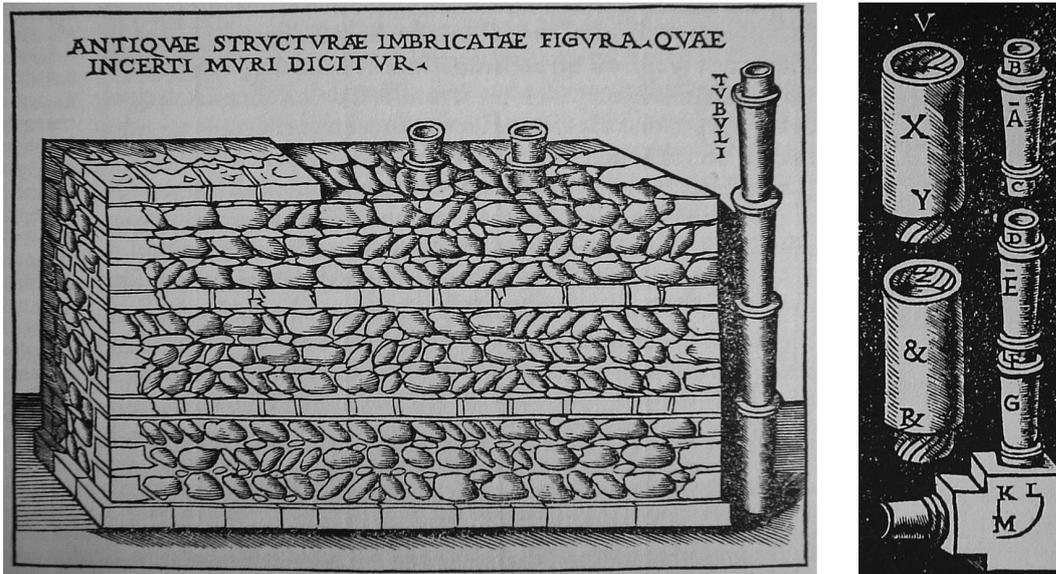


Figure 3: Cesare Cesariano, *tubuli (canoni)* to collect rainwater, wastewater and faecal matter, and *fistule* or metallic pipes; (Cesariano 1521, p. XXXVIIIv and p. CXXXv).

In general, *necessari* consisted of a little room with a wooden door and a ceramic tile floor with one or more *sederi*, or seats in masonry, inside, with the surface to sit on covered with wood and the holes closed with a *coperto d'asse*. Sometimes, however, as happened in the case of the home for rent in the parish of Santo Stefano in Brolo, in a room, there could be a unit built into the wall with the *sedere* inside, hidden by a wooden door (ASCMi n). Under the seat was the *vaso* which was connected to the brick *canoni* that were the vertical drains, similar to those used for sink drains, but they were wide enough for "neither faeces nor urine to go down without touching the walls of that shaft" (Cornaro 1980, p. 64) (Fig. 3). These led into an underground conduit that led then to the cesspool, if it was not just under the latrine (there are citations of conduits in brick masonry covered with bricks of 2/3, one of the typologies of bricks generally used in flooring), or they emptied directly into it. From the documentation analysed, it is not possible to determine if in Milan, too, as sometimes happened in Genoa and Rome, sink drains were routed towards those of the *necessari* to help clean them. Cesspools, including the covering vaults, were in brick masonry while "the mouth of the cesspool should be made of stone" (AOMMi d), that is to say, it was closed with a stone, almost always *sarizzo*, which could be removed to allow the periodic emptying of it. When necessary, cesspools could also be constructed under public property near the houses of those making such requests and as near as possible to the place where the latrine was. In these cases, the greatest possible care was taken to put the cesspool very deep in the ground and "cover it well so that any kind of stench could be completely eliminated" (ASCMi o), "so that it cause no nuisance, nor damage, nor indecency in the street" (ASCMi a).

The main problem with latrines, as underlined by the treatise writers of the period, was the odour that came up from the drains, since siphons were not yet in use. Francesco di Giorgio Martini emphasized that the stench, becoming greater "from that place through the entire house" could cause in the inhabitants "very great diseases" and so, as a way of avoiding this problem, suggested "making a vent pipe where the putrid air and the foul-smelling corpuscle were canalised, which must go through tubes to the top of the house so that in no part of the house would it stink" (Martini 1967, pp. 335-336). His statement is also confirmed, to return to the Milan area, in the treatise of Cesare Cesariano, who speaks of "vent pipes for the stench transported upwards through tubes, like a chimney" (Cesariano 1521, p. CXXXIV). Although the treatise writers in the Lombard area were also concerned with suggesting the construction of such conduits of ventilation, in the descriptions of work done that were examined here, there is no evidence that might lead us to think that such systems were present.

THE HEATING SYSTEM OF THE HOME

Fireplaces

Proper climatisation was held to be essential for the comfort and environmental quality of the Renaissance dwelling, as can be deduced from the treatises of the period, where there are numerous suggestions for planning the building so that there were rooms appropriate for the winter and others for the summer (different orientation and dimensions, different material for the wall coverings, etc.). The importance that noble patrons attributed to the environmental quality of their homes, too, is expressed well in the writings of the dilettante of architecture Alvise Cornaro, who assigned architecture the "power of prolonging man's life", thus suggesting solutions that could create rooms that were climatically suited for habitation, that is to say, that could protect the user "from the two extremes of the year, that is, great cold and great heat, the mortal enemies of old age" (Cornaro 1980, pp. 56-57). The preferred method in Renaissance Italy, and in Milan, too, for heating rooms and at the same time illuminating them was the fireplace.

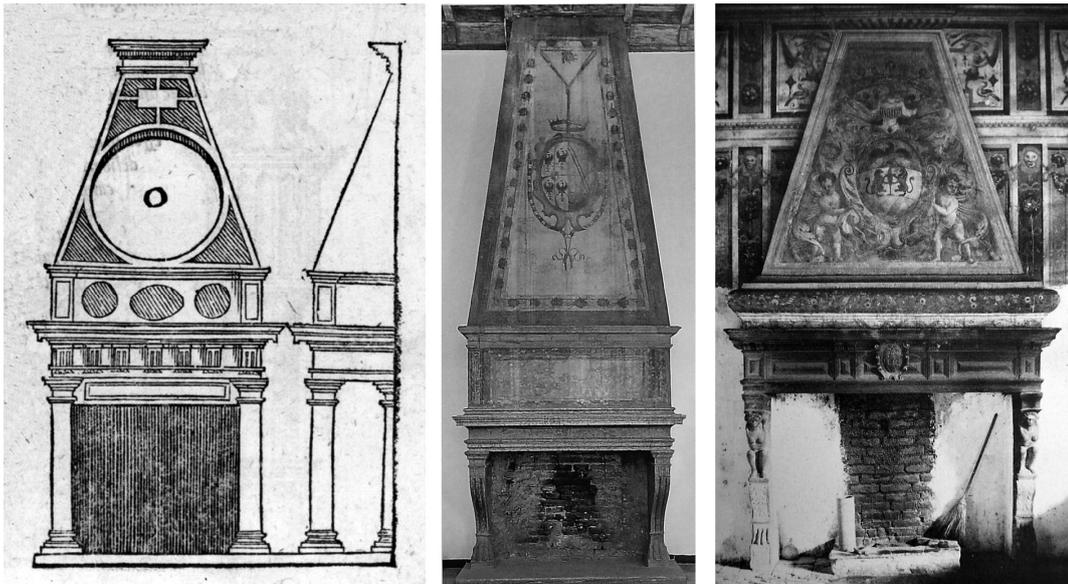


Figure 4: Fireplaces with protruding pyramidal section hood. Sebastiano Serlio, fireplace all'italiana (left); (Serlio 1987, book VII, p. 73); Villa Simonetta (Milano), the fireplace in the sala "del Toson d'oro" (middle); (Soldini 2007, figure 62); Villa Durini (Robarello), the fireplace (right); (Beltrami et al. 1892, III, plate XL).

In Milanese residences there were numerous fireplaces, as can be deduced from descriptions and inventories, where in rooms with fireplaces, *brandenali* (andirons) are inventoried. In medium-sized residences (30-40 rooms listed) five to nine are usually counted, while in bigger ones (60-80 rooms), thirteen to twenty-six are. First and foremost, a fireplace was found in the kitchen, where an oven was also sometimes located, and in the laundry rooms, as in those in the Palazzo Trivulzio in Porta Tosa and the Palazzo Spinola, where they were flanked by small brick stoves. Rather frequently they were found in other service areas as well, like dispensing storerooms and servants' dining rooms, while they were present more rarely in the stables, *canepe* (cellars) or *guardarobba* (a storeroom for personal or household goods). As far as the noble quarters were concerned, there were fireplaces in the proprietors' winter apartments on the first floor, but there were also fireplaces in the summer quarters on the ground floor. In these last cases, they also combined the practical function with that of a symbolic object, architecturally elaborated, richly decorated and often topped by family coats of arms or emblems. First of all, they were located in the staterooms, halls and smaller public rooms, that is to say, in reception spaces, or in rooms and studies, but more rarely in the bedrooms, like the "room where Signora Giustina sleeps" (ASMi w) in Palazzo Prospero Visconti and the "room where the Marquis sleeps" and the one "where Signor Don Alfonso sleeps" (ASMi n) at Palazzo Torre.

In the documents two types of fireplaces are cited. One is the classic fireplace with a protruding pyramidal section hood (Fig. 4), indicated in the documents simply as *camino* and described as "*camino (...) with a hood, flue, and torino [chimney stack]*" (ASMi v). The other, instead, is defined as a *camino alla francese*, and in a document it is specified as being placed "inside the wall" (ASMi n), and it is generally described as a "French fireplace, flue and chimney stack" (ASMi k), thus omitting the reference to the hood. This suggests an identification with those fireplaces that were built "all in the thickness of the wall", which Scamozzi called "alla Romana" (Scamozzi 1997, p. 322) (Fig. 5), and that Serlio instead defines as "according to the custom in France", adding that "its projection inside the rooms were not pyramidal like ours in Italy, but are all of equal distance from the bottom to top" (Serlio 1994, p. 318).

The treatise writers suggest not putting fireplaces in the supporting walls, which would be weakened by them, but "in the partitioning walls between one room and another" so as to obtain also the benefit "of one room heating the other" (Repishti 1994, p. 101).



Figure 5: Fireplaces *alla francese*. Vincenzo Scamozzi, fireplace *alla romana* (left) (Scamozzi 1997, II, p. 165); Villa Della Porta Bozzolo (Casalzuigno), fireplace in the *salone* at the ground floor (right).

In fact, during the construction of the body towards the street in Palazzo Spinola, for example, "in two of the abovementioned partitioning walls", two "French fireplaces in stone from Como, with the flues in the walls and the chimney stacks on the roof" were built (Baroni 1968, II, p. 421). The fireplace consisted of a hearth, which generally presented "a floor of bricks" (ASMi j), and at times at the back a "standing slab of iron inserted into the wall" (ASMi x), while sometimes floor and slab were in stone. The hearth was preferably placed on the same level people walked on, but in some cases the hearth was higher, as must have been the case in the fireplace in the kitchen of the Palazzo Mazenta, where there was "a closet under the fireplace" (ASMi e) and perhaps with the one in the great hall on the *piano nobile* of Palazzo Spinola, also with "a painted closet under the fireplace" (ASMi y). The hood in pyramid form, when present, was in brickwork (one brick wall), and was supported by a wooden frame (the expression "hood in brickwork and wooden frame" frequently recurs), but the frame could also be in stone, with its lateral supports, *gambette*, for example in Palazzo Torre there was a fireplace "with a hood and *gambette* in brickwork", another "with a hood in brickwork, frame and *gambette* of *ceppo*" and another "with a hood in brickwork, frame and *gambette* in stone from Como" (ASMi n). In the case of fireplaces without hoods, there were moulded surrounds in stone around their mouths. Stone fireplaces were mainly used in the halls and rooms of nobles. The documents say they are in *ceppo*, in stone from Como, in *sarizzo*, in stone from Angera and in *macchiav vecchia* from Arzo and obviously the greater the importance of the room, the more sumptuous the ornamental elements. For example in the hall of the Casa dei Pozzo, there was a fireplace "framed with *gambette*, and bases and capitals in stone from Angera" (ASMi k). There are few data related to the dimensions of the fireplaces and their hoods: widths of 2-3 1/4 *braccia* (1.18-1.92 m) have emerged, and only two measurements for the protrusion of the hood, 24 once in one case and 28 in the other (1.18-1.38 m). The flues, generally made of "bricks [arranged] edge-on and mortar" (ASMi z), were built into the masonry, and it was recommended that they be placed "far from the beams and any sort of wood" so that "fire not reach them" (Pellegrini 1990, p. 86). The chimney stacks, which were also in masonry, were high above the roof and covered with curved tiles. Cornaro suggested making them round with mouths and with "a chimney cap, so that strong winds do not keep the smoke from going out, and besides that, so that with strong winds, the rain does not enter the chimney" (Cornaro 1980, p. 63).

The fireplace was equipped with doors in wood, sometimes painted, with hinges and latches, to close the mouth of the fireplace, thus keeping air from entering the rooms when they were not in use. With a certain degree of frequency, *telari di ferro* (iron frames) and *lamete* (plates) for fireplaces are also cited, perhaps iron plates put all around the mouth of the fireplace to diminish the opening, or only under the architrave of the mouth, so that "the smoke might go more easily upwards" and that they might "produce heat in the room once they were heated" and if lower they might "heat the room even more" and the "fire not go in the faces of the people" (Serlio 1994, p. 320). In fireplaces, especially if used to cook, there were, then, iron bars upon which there were hooks to hang pots from.

The cost of fireplaces varied according to dimensions, materials and decorative apparatus. For the years 1573-74 the following costs were found: 8-15 *lire* for a French fireplace, 90 for a large fireplace and 30-40 for fireplaces in brickwork with hoods and chimneys; in 1589: 12-18 *lire* for a "fireplace (...) with hood, flue and chimney stack" (ASMi v) for a room and 20 for a kitchen fireplace; in 1596: 123 *lire* 8 *soldi* for a fireplace in *macchiav vecchia*. An estimate for the Villa Gonzaga-Simonetta of 1567 makes it possible to compare the prices of fireplaces constructed in different materials: 10 *lire* were spent for fireplaces in brickwork and for "simple fireplaces", 54-57 *lire* for French chimneypieces in *sarizzo*, 198 *lire* for a fireplace in "Veronese mottled stone" (Soldini 2007, sp. 418-431).

The numerous suggestions given by the treatise writers on how big to make hoods, flues and chimney stacks, and how to construct them were aimed towards favouring the well-being of their users, who, if they followed them, would not suffer from "vexation from smoke" (in one document, one reads of rooms in which "one cannot (...) stay because of the smoke", ASMi z) nor any "harm to the sight and main members" because of the excessive heat. At the same time, by following these suggestions, they could also enhance the *décor* of their homes, which would not become "blackened by soot" (Martini 1967, p. 335).

Stufe and bathrooms

Another way of heating spaces was the stove (*stufa*), which, however, was not part of "the Italian tradition, except in the Alpine regions" (Thornton 1991, p. 27). In fact, stove and fireplace "go back to two different cultures, to two different ways of living man's relationship with fire, heat and light (the fire of the stove does not illuminate)", and this may be why in countries like Italy and France, where the tradition of using the fireplace was consolidated, the stove was not very widespread even though it made it possible to "save fuel and better exploit it (about two thirds of the heat of a fireplace is lost in the hood)" (Sarti 1999, pp. 109-110), thus also solving the problem of smoke. Nevertheless, in Milan, as in other Italian cities, the documents attest to the presence, although rare, of stoves in noble residences, but they were mainly destined for particular rooms: the *balnea*. There were six buildings in Milan for which references to the presence of a *stufa* were found, but it should be noted that in the Milanese milieu, this term not only indicated the *stufa* itself or particularly hot room that was often linked to it, but also the brazier. In Palazzo Archinto, for example, there was a "copper *stufa* in the great hall to heat the plants" (ASMi aa), an expression that makes one think of a brazier, while in the little house with a bakery and related oven, acquired by Prospero Visconti to expand his noble residence, there was a "*stufa* above the above-mentioned oven", undoubtedly a small room where bread was left to rise. In the noble residences of the Spinola, Mazenta and Maserati, and in the Villa Simonetta, the presence of a *stufa* seems instead to be connected to a bathroom or at least to a sauna.

The diffusion of bathrooms in the noble homes of the early Renaissance represented on the one hand an appreciable increase in their comfort and on the other in their elegance. Nevertheless, the habit of building them in one's home began to decrease after the Council of Trent, when Counter-Reform theoreticians banned baths. In any event, people continued to construct bathrooms, but with less frequency and "primarily for reasons of health and hygiene" (Thornton 1991, p. 319). Among other things, we might also note the bathrooms present in numerous noble residences and villas in Genoa (the residences of the Spinola and of Bartolomeo Lomellino, the villas of the Spinola and the Grimaldi, etc.), which constituted an "important aspect of the «comfort» and «modernity» of Genoese homes, qualities that were praised by foreign travellers" like Rubens (Hanke 2004, p.143) and the construction of which was probably "influenced by Turkish [sic] bath, wick [sic] were well known to de Genoese through close trade links with Constantinople" (Hanke 2006, p. 223). Thus it is not surprising that Leonardo Spinola of Genoa had a small bathroom or sauna built on the first floor of his noble residence in Milan, as would the presence of a "small room called the *stufa*" lead to one think of (ASMi ab), despite the fact that the building was constructed when Carlo Borromeo was archbishop, and there was such a severe Counter-Reform atmosphere in the city. Instead, in their noble residence, the Mazenta had a bathroom located on the mezzanine above a room, where there was a "green *Stufa*" – probably covered with majolica tiles – enclosed by "wooden frames that covered it, with its *telari di stamegna* [wooden frames with oiled white linen]" (ASMi e), that seemed to delimit a little sauna. Finally, an estimate of 1567 of the Villa Gonzaga Simonetta contains the description of two bathrooms: for the first on the ground floor, it is described "stufa and bath with its floor, the ceiling, the boiler, marble mask and other things"; the second, located on the top floor, was composed of three rooms and two loggias and included the "stufa with a copper basin with four pedestals and *sarizzo* frames and the rest", and a French-style fireplace (Soldini 2007, pp. 420 e 421-422).

CONCLUSIONS

The present study (brief references to the argument already appeared in: Giacomini 2007, pp. 134-137) has shown that the homes of Milanese nobles, and in particular the richest, were equipped with technical plants essential for making them more comfortable and healthy to live in. A technical plant system was almost always built by following the most up-to-date advice in the treatises and that in Milan was preserved unchanged until the end of the eighteenth century, when exclusively in noble residences, there is evidence of the "first signs of innovation in the field of domestic systems" recognisable in the diffusion of the first "bathrooms with so-called *lieux à l'anglaise*" (Caspani 2005, p. 229). The attention to themes related to the environmental well-being and salubrity of the home seem to give a common ground to the urban social classes (from craftsmen to the patricians) who could afford to own a home, even if of small dimensions. However, the greater economic assets of the *élite* certainly encouraged the multiplication of technical plants in their residences. Those plants, which were analysed here, so assumed a significance of social distinction, especially if referring to equipment, as the bathroom, in which the connotation of voluptuary, in the sensibility of the period, tended to outclass the connotation of hygienic.

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