Systematic improvement in Lancaster was begun in 1855, and it included a public water supply in place of wells, a system of sewerage in place of open square drains, and a system of wc's instead of cesspools and middens. An earth closet system for the poorer houses was initiated in 1866, and in three years it comprised 90 earth latrines to serve some 2250 persons. In Edinburgh, some parts of the city had water-closets, and the soil from these was used to irrigate land to the north-east of the city. In the poorer parts, wc's were found to be unsuitable, and almost all the huge tenements had neither wc's nor privies nor ashpits attached to them.* The excrement from these, together with all town ashes and other refuse (a total of 50000 tons a year) was taken to depots to be sold as manure. The whole cost of cleaning the city, including the profitless removal of mud and snow, was £13000 a year; the sale of manure realised £7000. Of the 90000 families in Gasgow, 40000 had no wc's. Here the manure contributed £18000 to the £27000 annual cost of cleansing.

It is clear that the introduction of wc's was attended by some difficulties. Appendix 4 of the 12th Report of the Medical Officer of the Privy Council (1869) discussed at some length the relative merits of earth closets, water-closets and middens.

The difficulties are illustrated by the experience at Lancaster:[18]

> "At the grammar school at Lancaster, (the water-closets) were always getting out of order, by reason of marbles, Latin grammar covers and other properties being thrown into them, and by their machinery breaking under rough usage."

The wc's at Lancaster school were replaced by earth closets — a method to which the Medical Officer of the Privy Council devoted a good deal of attention in his 1869 report. Fresh earth was supplied to the closet pit once a day, and the manure was removed at intervals of a month or so. The report adds that the headmaster obtained remarkable results by the application of the earth manure to various garden crops. The earth closets used in the town itself seem to have been satisfactory from a health point of view. The Medical Officer's report concluded that the earth closet, properly managed, was a satisfactory method, and indeed has some advantages over the wc. The report considered the midden, the pail, the box or trough system, the earth system and the wc, but could not "affirm of any one of the methods that it will develop into the only perfect system of the future" (Fig. 7.7).

In other towns, misuse was reported, since the closets were common to several families, and they were uncared-for.

A design for a trough closet used at Liverpool seems to have been fairly satisfactory (Fig. 7.8). This was to a large extent due to placing on the several users of each closet a responsibility to ensure their cleanliness. There is an opening giving the scavenger access to the trough and the water supply. "The scavengers are employed by the corporation, and every day they visit each of the trough closets, discharge the contents of the trough, flush it out with water, sweep it clean and leave it charged with fresh water for the next 24 hours' use."[18]

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*"For the most part, the poorer people deposit their excrement, ashes and house refuse of all sorts in pails, and keep these actually within their living-rooms, or some adjoining recess or passage, until the time comes for the daily removal of the pails into the street in expectation of the scavenger's visit."[18]

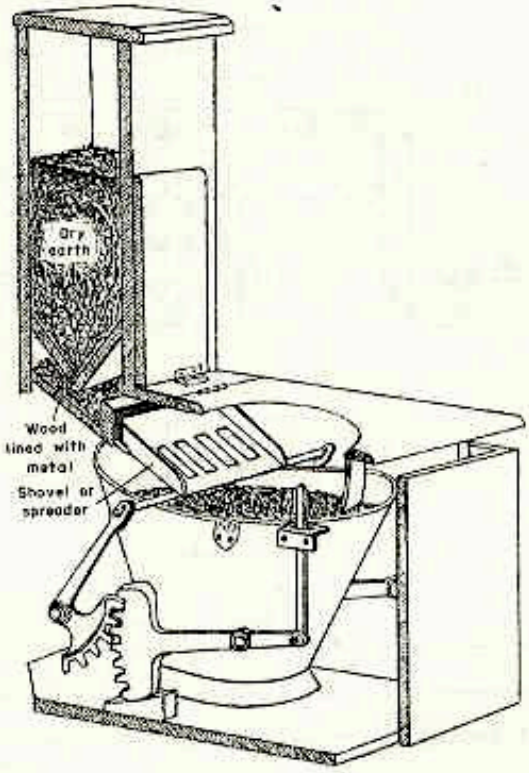

Fig. 7.7. Earth closet (*ca.* 1923).
(Courtesy, O.U.P.)

7.2.6 20th century sanitation

Progress was slow. As late as 1923, Adams wrote:[13]

> "The water-carriage system is rapidly replacing conservancy (i.e. earth closets, privies and middens) on account of the difficulties in the effective and sanitary operation of the latter, and many large towns have decided to abandon the latter system altogether... . Up to as recently as 1910, the pail system was fully retained in Hull, Rochdale, Warrington, etc. In Manchester, privies and middens were replaced in 1871 by pail closets, which in their turn were superseded in 1908 by water-closets."

The Appendices to the British Green Paper "Housing Policy" (1977)* show that modern amenities were lacking in many dwellings even comparatively recently. In 1914, a bathroom or an indoor wc was a rarity in working-class homes. Even in 1976, 1.64 million households in England and Wales (9%) were without an indoor wc, while almost 1 million did not have a fixed bath. It was not until 1944 that the Dudley Report recommended the provision of a bathroom in public housing. Statistics for other countries are illuminating:

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*Cmd 6851 (HMSO, 1977).

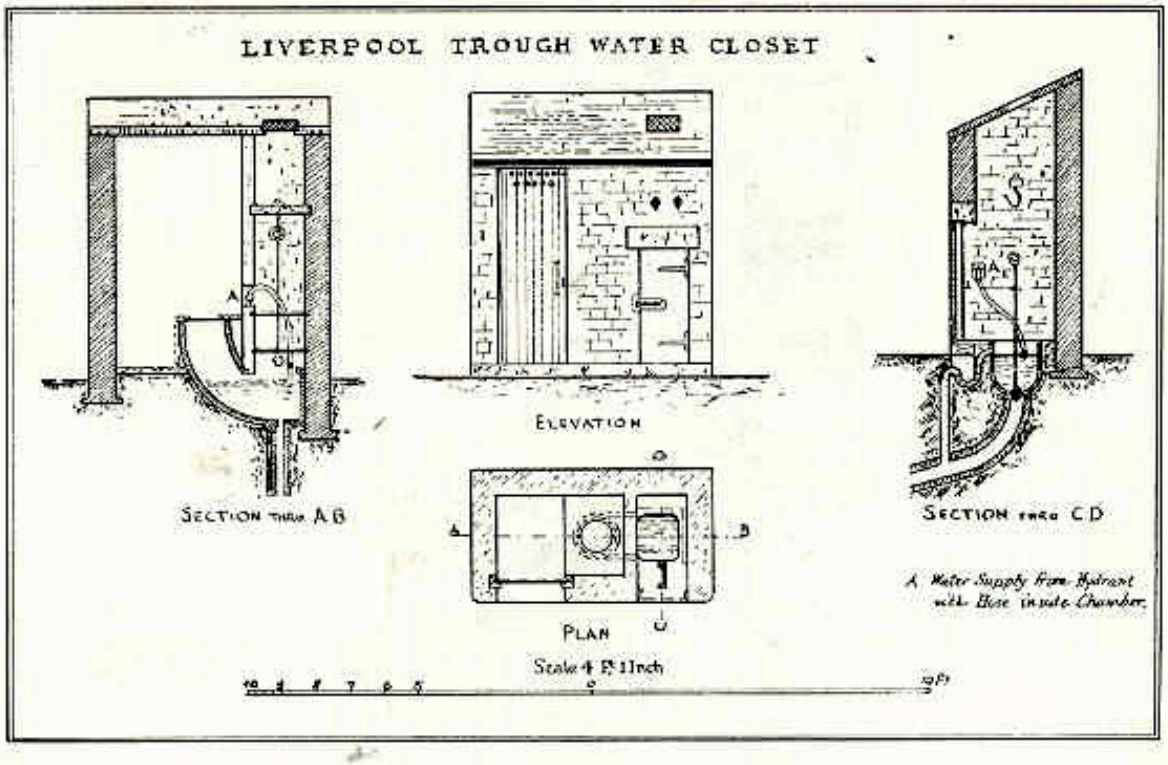

Fig. 7.8. Liverpool trough water closet.

	Proportion of dwellings without	
	bath or shower	flush toilet
Australia	-	10.5 % (1971)
Austria	45.5 (1970)	-
Canada	10.2 (1967)	5.7 (1971)
Denmark	36.6 (1965)	3.8 (1970)
France	51.1 (1968)	48.2 (1968)
W. Germany	17.6 (1972)	5.8 (1972)
Japan	34.4 (1968)	-
Italy	71.1 (1961)	20.9 (1971)
Norway	54.8 (1960)	28.2 (1970)
New Zealand	1.9 (1971)	2.9 (1971)
USA	5.0 (1970)	4.0 (1970)
UK	9.1 (1970)	1.1 (1970)

7.3 BATHING

7.3.1 The Greek, Roman and Islamic world

Bath tubs of stone or clay have been found in archaeological sites in Assyria (from 14th century B.C.) and in Babylon (from 25th century B.C.). At Knossos, decorated tubs of terracotta, dating from 18th to 15th centuries B.C., have been found. These baths had the tapered elongated form of the modern bath (Fig. 7.9).

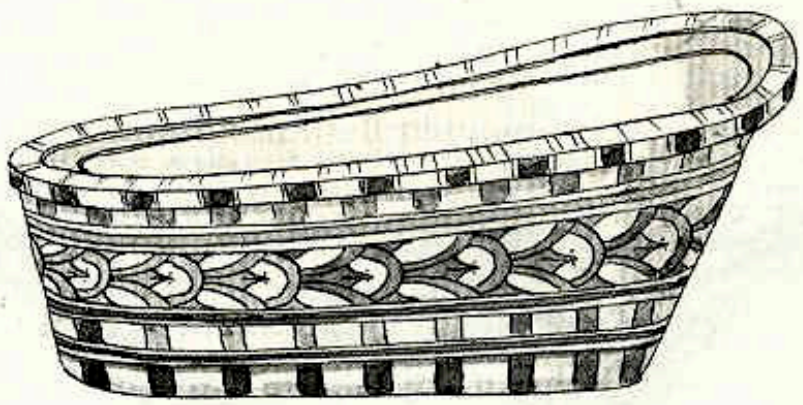

Fig. 7.9. Terracotta bath from Minoan Palace, Crete.

In Egyptian civilisation of the same period, bath tubs were unknown. Instead, the bathers were sprinkled with water. In the bathrooms of the larger houses, the water drained away through a hole in the floor.

In the 6th century B.C., in Greece, baths began to take the place of sea and river-bathing.(2) As in Egypt, sprinkling and showers were important features of Greek baths. A large pedestal basin was employed, and slaves sprinkled the bathers. The "sweat" bath, with shower, appeared in Sparta a little later. Public baths were provided for the poorer people.

Bathing became a well-developed social habit in ancient Rome. The Romans set up, throughout their Empire, the "thermae" or bathing establishments, which served as communal leisure centres. The most famous of these are the Baths of Titus (built in A.D. 80 on the foundations of Nero's "Golden House") and the Baths of Caracalla (A.D. 211-217), both in Rome.(53)(54) The Baths of Caracalla could accommodate 1600 bathers; the Baths of Diocletian at Split in Yugoslavia (*ca.* A.D. 300) are said to have been able to take twice this number.

As the Roman Empire developed and expanded, their baths became larger and more elaborate, and also more formalised in their design. This can be seen in Hadrian's Baths at Lepcis Magna (A.D. 126-7) on the coast of North Africa, where the building included an open-air swimming bath, a cold room (*frigidarium*), cold plunge-baths, a hot room (*calidarium*), and a number of superheated rooms or sweating baths (*laconica*). Also, wherever the Romans found hot springs they used them, as at Bath.

Roman villas, too, had their baths; and an important step was taken when the hypocaust was introduced. Various means of heating the water for small baths were used. One consisted of an urn within which was a pipe to contain a fire. Another, described by Seneca, was a "once-through" heater, made from a spiral copper pipe through which the water flowed, the pipe being heated by the flames of a fire.

The Greek and Roman "sweat" bath developed into the Turkish bath, and appeared in eastern Europe and Moorish Spain.

The Muslim bath (*hammām*) is believed to be directly inherited from the Classical World, but with emphasis on Islamic concern for both ritual and cleanliness, rather than social and sporting aspects. Early examples include the Bath (172-15 B.C.) at Qusayr'amra (now in modern Jordan) belonging to the Umayyad Period, during which the large and magnificent baths of the unfinished Palace (740-50 B.C.) at Khirbat-al-Mafjar (in present-day Israel) were also constructed where "sixteen piers carried a roof of barrel vaults and domes over a great frigidarium".(41)

The earliest known public hammāns date from about the middle of the 12th century. A typical public bath is the Hammān-al-Bzouria of Damascus, containing a disrobing room and fountain, and with cold, warm, hot and steam rooms, and lavatories.

One of the best preserved Islamic buildings in Spain is the Bath at Ronda (12-15th centuries?), which is a rectangular building with three barrel-vaulted chambers (the calidarium, the frigidarium, and the apodyterium), and a courtyard with a pool. It is known that the water supply for the bath was drawn by a water-wheel from the river and poured into a system of gulleys.

In Istanbul, the Haseki Hürnen Hammân (1556) is an outstanding example of baths built during the Ottoman period, with separate facilities for men and women (Fig. 7.10).[41] Turkish baths were freely available to everyone in Buda after Ottoman domination; they were still in existence after the recapture of the city by the Christians in 1699.

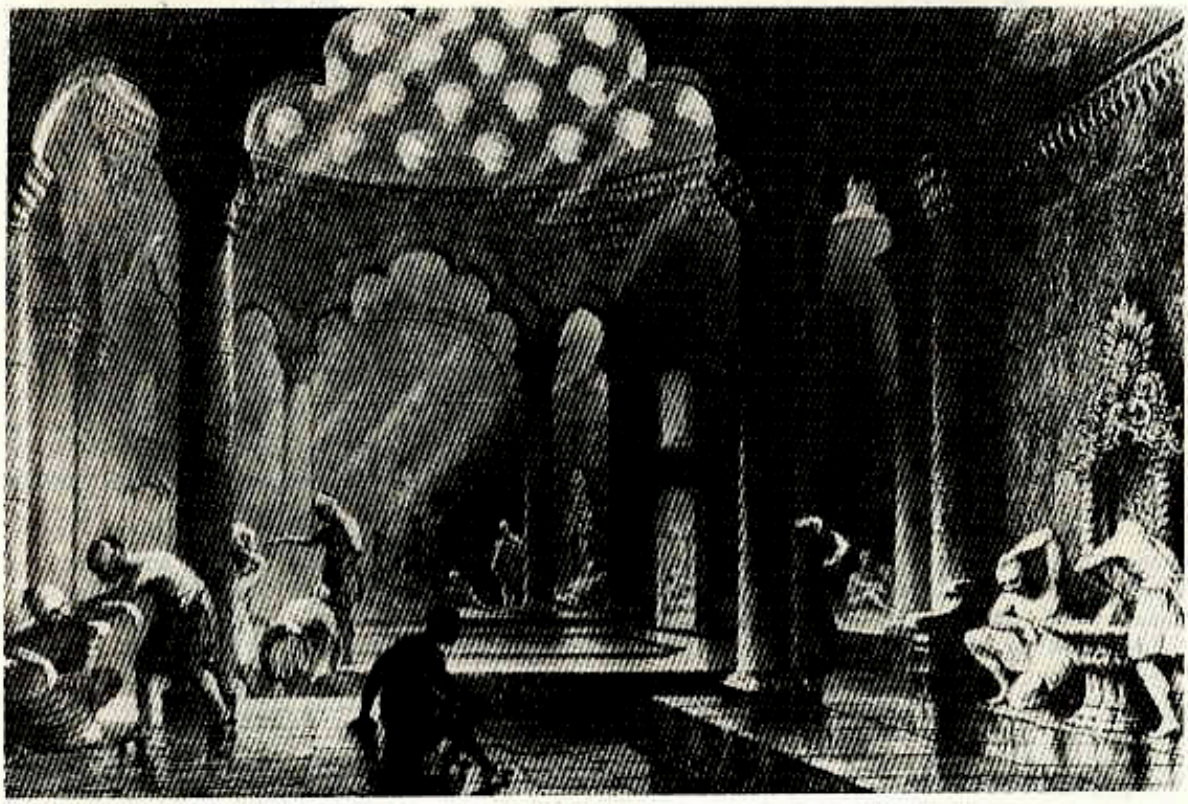

Fig. 7.10. The Çağaloğlu Hammān (Bath), Istanbul, Turkey (18th century).(41)

In India, from the 8th century, there developed a form of "water architecture" which included stepped wells, bathing fountains and "ghats", reservoirs and stepped tanks.[43] Over the next 1000 years, these became extremely elaborate, many examples providing facilities for ritual bathing and festivals, with water storage and "retreat rooms" (Fig. 7.11).

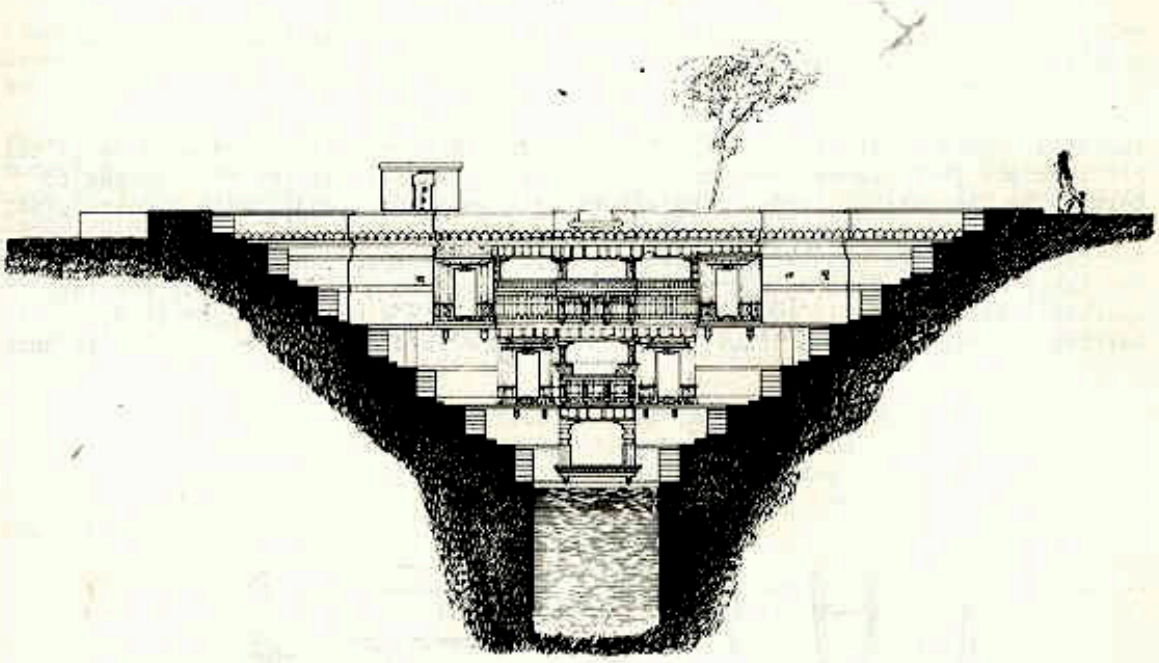

Fig. 7.11. A stepped tank or bath: the Sabali Kund-way Gujarat, India (*ca.* 1500).

Bath tubs seem to have been used in the Far East. In China, the bath was heated directly by iron boilers beneath it.(2) A Japanese tub was oval in shape, and at the narrow end, an iron or copper pipe, in which a charcoal fire could be placed, was built in.

7.3.2 The Middle Ages

The practice of bathing seems to have been largely forgotten (at least in Europe) with the decline of the Roman influence, only to be revived for a time in the Middle Ages. The monasteries had their lavers, and there was probably some friendly competition with the owners of castles and manors over the standard of facilities provided. Some travellers took no chances, for King John (1199-1216) was accompanied on his journeys by his travelling bath and bathman.(35) At the castles of Warwick (*ca.* 1070), Aydon (*ca.* 1280) and Compton (1320), there are washing sinks with drains in the service quarters, while there is a hall laver in Battle Hall, Kent, (*ca.* 1330). Public bath houses (with mixed nude bathing) were again established.

Gimpel states that standards of hygiene in the 12th and 13th centuries were relatively high, but progressively the authorities worried about the permissiveness in the public baths; and the incidence of the Black Death hardened this attitude. There were 32 privately-owned public baths in Paris in the 13th century and for their use, 2d. was charged for the steam bath, and 4d. for a tub bath (1268). In London, too, the communal delights of the Turkish bath were introduced by returning Crusaders. By the reign of Richard II (1377-1399) there were eighteen bath houses or "stews" in Southwark alone, and the waterfront came to be known as Stewsbank.(54) These stews were owned by the Lord Mayor of London, William Walworth, and probably made a handsome profit from the immoral business done on the side, and to which the Church objected. The stews were finally closed down by Henry VIII.

The prudish attitude caused bathhouses to close; and hygiene disappeared from Western society, not to re-appear for 500 years. Public baths were, however, retained in Finland and Russia.

The Renaissance in Italy gave rise to sumptuous bathrooms in the palaces (e.g. the Pitti Palace in Florence, and the Palazzo del Té in Mantua); and this spread to Germany in the wake of trade. There were also washhand stands, with a waste pipe, but they had to be filled by hand from cans, in the absence of a water supply. For the mass of the population, however, with the disappearance of the bathhouse, the habit of bathing as an aid to health was forgotten. At the end of the 18th century, there were only two bathhouses in Paris, for a population of 54000. Bathing was regarded as a luxury, and those who wished to bathe used a tub at home (Fig. 7.12).

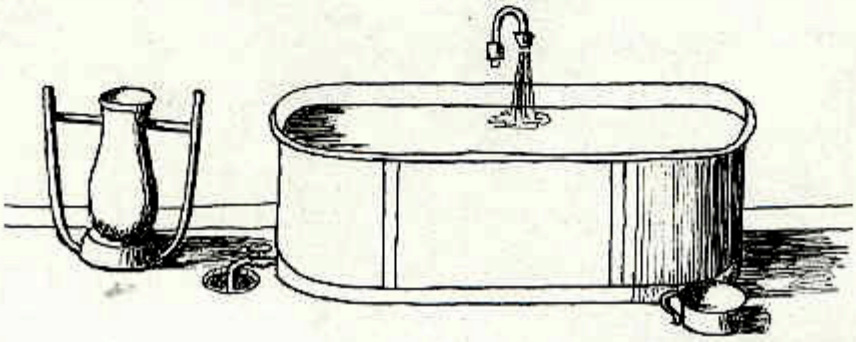

Fig. 7.12. Domestic bathtub, Germany (late 18th century). At left 'cylinder" heater for bath.

7.3.3 The 19th century

The influence of Rousseau's philosophy led to a revival of the habit of bathing, both in France and in Germany in the mid-18th century. Contemporary reports suggest that bathrooms were becoming commoner. The metal tub itself was small, of the size of a sitz-bath, with an emptying tap. A copper vessel in the bathroom was used for mixing hot and cold water, and there was sometimes a secondary heater in the form of a cylinder containing burning charcoal which could be immersed in the water.

In spite of the obvious risks of poisoning, the apparatus was used for many years.

As the demand for bathing facilities grew, in advance of adequate water supplies, portable tubs were developed. One such was in the form of a sofa ("baignoire"); another like a sabot. Water had to be carried in horse-drawn carts, from which the water-carriers took water to the houses. In the early 19th century in Paris, a bathroom was still a luxury enjoyed by few; but portable tubs could be hired. These came on a cart, together with a supply of hot and cold water. The whole family would bathe, one after the other, in the same water (for refilling was too costly), and sometimes the water would be used for laundry as well. These bath-wagons were also used in Berlin, and it was related that when Kaiser Wilhelm I desired a bath, he hired a tub from the Hotel de Rome. The Frankfurt bath-ship was

famous. The superstructure resembled a Greek temple. In the for'ard part of the vessel there were 8 small bathrooms; in the stern section there was a family bath and a toilet. River water was pumped aboard and heated by a boiler amidships.(2)

There was some revival, too, of public bath- and wash-houses, though in these more modern establishments, each customer had his own cubicle. The Rheims baths were used by 30000 persons a year, and 300 tonne of laundry was washed. The Leopoldstadt baths in Austria (1855) had a swimming bath as well. The Hamburg baths, built in the same years, had a Perkins heating system which heated the drying room; small stoves provided for heating irons. But the conservative German house-wife made little use of such establishments. The Russians had public steam baths, for a traveller in 1873 records: "In Moscow, our road was lined with public hot rooms"; they were used by both sexes and were cheap.

The private bath-tub or bathroom spread quickly in the latter half of the 19th century. This was due in part to the knowledge of hygiene based on the work of Pasteur (1822-1895), Eberth and Koch (1843-1910), and Lister (1827-1912), but became possible only with the construction of water supply networks. As usual, the spread occurred first among the upper classes.

> "As early as 1813 the Earl of Moira's Donnington Park in Leicestershire had two bathrooms and at least six water-closets, on two floors. His wife had a water-closet and bathroom off her dressing room; the bathroom was furnished with a gilded wash-hand stand, a dressing stand with gilded basin and ewers, a rosewood book stand, a thermometer and a copper tea kettle. Immediately below, her husband had a water-closet and bathroom off his study and powdering room. By the late 1830's and early 1840's the Dukes of Buckingham were equipping Stowe with plumbing almost as lavishly as their predecessors had equipped it with temples. By 1844 it had at least nine water closets, a shower bath and four bathrooms. The shower bath, which was in the Duke's apartment and had piped hot and cold water, was not altogether a new phenomenon; the Duc de Levis had described it as a 'machine... now very much in use' by the English in 1815."(32)

Burton notes that up to about 1850 in Britain, piped water was hardly ever available beyond the kitchen sink, and the portable tub in the kitchen was the common method of bathing.(19) Some of the larger houses did have a bathroom, even though there was no hot water supply to it, nor any drain from it. He says that when Queen Victoria married, there was only one bathroom in Windsor Castle. Hellyer did not approve of the English viewpoint, for in 1877 he wrote(33)

> "In every house, a wc may be considered a necessity. But by English people, lavatories and baths, fitted up with hot and cold services, would, I suppose, be considered a luxury."

The tub was shaped to correspond roughly with the human form. Cheap baths of zinc or copper, often cased in wood, were produced. One American product of the time was made of compressed wood fibre, enamelled inside. Around 1900, when the sanitary industry expanded rapidly, a nickel-plated steel bath was made. But cast iron soon dominated the market, because the casting could be decorated, and because it could be given a long-lasting enamel surface. English and American manufacturers also produced ceramic baths.

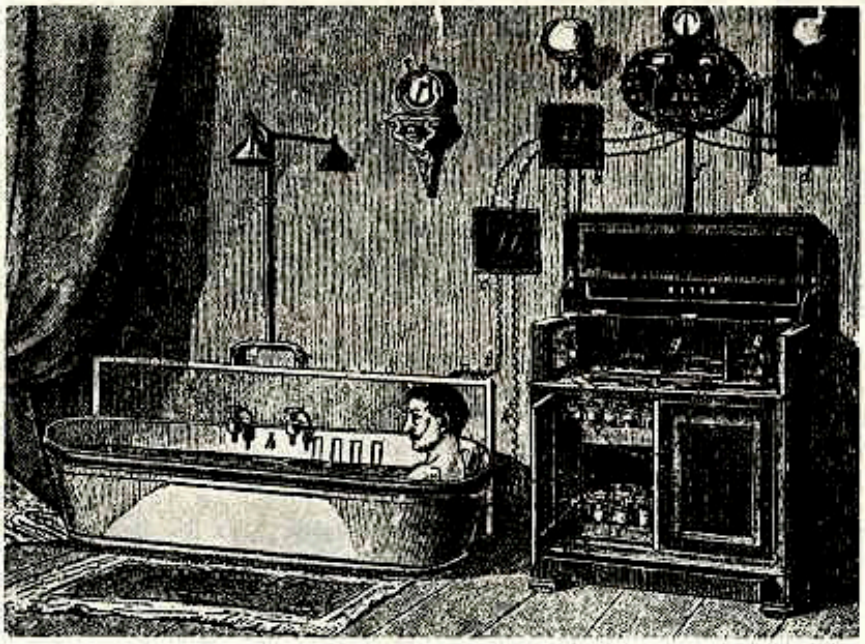

Fig. 7.13. Electric bath installation, with all necessary appliances for constant and Faradaire current application — from GEC catalogue of 1886.

On the continent of Europe, the bidet was introduced at about the same time; but showers were scarcely used in either Europe or the USA at the end of the 19th century.

7.4 CLOSETS

7.4.1 Greek and Roman times

Archaeological evidence indicates that water supply and drainage systems existed in many of the ancient civilisations. Toilet facilities existed in the palaces, and some private dwellings, in Assyria, Babylon, Egypt, Greece and Crete. The toilets comprised a stone or wood seat on pillars, built over a drainage channel or water course to carry the faeces away. At Knossos, it is possible that the toilet was flushed with water after use. Babylon had many public as well as private toilets. Four thousand-year old dwellings in the Indus valley provide evidence of latrines and water-borne sewage.

In ancient Rome, sanitation reached a peak of development. In the earlier days of both Greece and Rome, rooms were set aside as toilets, and portable vessels were used. The baths of Lepcis Magna had large marble latrines in which the occupants sat on marble seats on three sides, while regarded by a statue in a niche on the fourth. Later, in Rome, the richer people had closets with water cleansing, sometimes from a flushing tank, operated by a tap. Many public toilets and urinals were provided, for the use of which a charge was made. Arrangements for public lavatories, which were a normal social feature of Roman towns, can be seen in well-preserved ruins as at Ostia and at Timgad in North Africa, founded as a "colonia" by Trojan in A.D. 100. At the centre of the town of Timgad lay the Forum, and off

one side the public lavatory containing rows of stone seats sometimes separated by arms carved as dolphins, but otherwise public in the truest sense of the word (Fig. 7.14). And in Britain:

> "At Housteads on the Roman wall in Northumberland as many as twenty men could sit and enjoy the sight and company of their companions, sending their offerings to Stercutius and Crepitus, the gods of ordure and conveniences, and Cloacina, the goddess of the common sewer."(37)

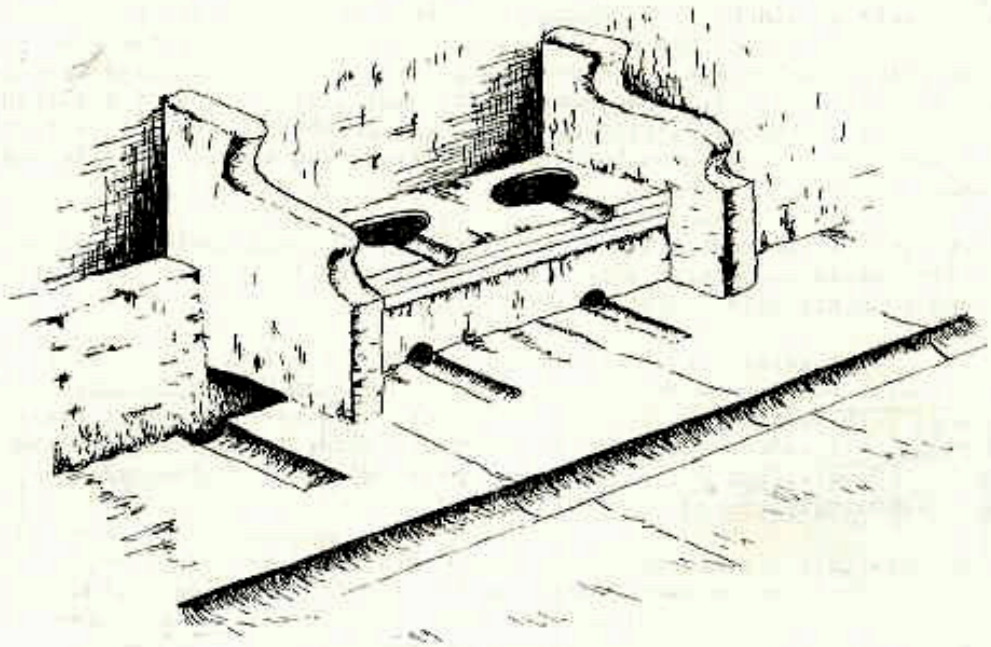

Fig. 7.14. Public toilet at Timgad (Algeria).

An obsessive preoccupation with sanitation may have even contributed to the downfall of the Roman Empire according to the writings of Rolleston (1751):

> "- we may date the commencement of (their) ruin from the introduction of gold and silver chamber pots and close stool pans".

In Islamic and Jewish countries, cleanliness was highly regarded, and there were definite requirements as to toilet and bathing facilities. In Islam, there were many public toilets, especially close to mosques and bath-houses. The English traveller, Ogilby, reported that in 1670:(2)

> "In Fez there are, near the mosque, about 150 common conveniences, each with a tap and marble cistern, and all trim and clean, as if these places had been intended for more pleasant purposes."

7.4.2 Medieval castles and palaces

In those parts of northern Europe which remained free from Roman influence, or from which the Romans withdrew early, sanitary arrangements were primitive. Only in the monasteries and castles was good sanitation to be found.

In mediaeval castles, this often comprised a small turret projecting from the facade, and provided with a toilet seat. Excrement was allowed to fall directly into the moat, or into a receptacle which had to be periodically cleared. In the Northumbrian castle of Langley, in the 13th and 14th centuries, closets on three floors were arranged so that the separate waste shafts from each led into a common cess-chamber. At the Castel del Monte (built *ca.* 1240), rain water collected from the roof was used for washing down the toilets.

> "Henry III, in a typical order, instructed his sheriff at Southampton 'to make in our castle at Winchester, behind the chapel of St. Thomas the Martyr, a certain chamber for the use of the bishops, and a chimney (fireplace) and a certain privy chamber for the same! Where practicable, the privy was placed as far away as possible, on account of the smell, at the end of a passage in the thickness of the wall, with access to the chamber by means of a right-hand turn. Sometimes, as at Woodstock, Henry III ordered double doors to reduce the smell further."(35)

Henry III (1716-72) subsequently ordered privies to be built into all his residences. At Winchester Castle he ordered a garderobe tower constructed "in the fashion of a turret", and complete with a ventilation shaft.

At the archbishop's palace at Southwell (*ca.* 1360) the privies were housed in a separate circular building away from the palace. Bodiam Castle in Sussex (*ca.* 1386) was furnished with twenty-four privies built into the walls, all with drainage. Water flushing devices were provided in the Eagle Tower (1317) of Caernarvon Castle and at Denbigh Castle, but in spite of all these improvements the problems of smell and cleaning generally proved insuperable.(35)(57)(58)

At St Cross Hospital, Winchester, which dates from the late 15th century, the brethren's dwellings are on two floors, and each includes a closet, built in a gabled projection on the external wall. "A swiftly flowing water course, diverging from the River Itchen, to which it returns at some distance from the building, immediately gets rid of all impurities, and is a most simple and effective sanitary arrangement." (Since the water course flowed beneath the bedroom and scullery windows, the hygiene is rather doubtful — NSB/BMR.)

In the towns, arrangements were primitive, and the discharge went straight into the streets. Only in the richer towns were privies erected, but these were seldom emptied. In the 14th and 15th centuries, London had only a dozen or so public latrines, some built over the Thames (on London Bridge), over the Fleet and the Walbrook — all rivers from which the city obtained much of its water.

In the 17th century, private toilets were introduced to Germany from France, but then only for the richer people. Up to then, the better class had only portable commodes. In 1588, the Elector of Saxony had made a commode on wheels, which he took with him whenever he left his residence. It also had a table with drawers, a medicine cupboard and a small stove to warm water. When opened up, the contrivance could be used as a bed.

As a consequence of the unhygienic conditions in which the mass of the population lived, illness was rife. Attempts were made to ameliorate them. The architect Filarete built the Ospidale Maggiore in Milan (*ca.* 1456). In this hospital, the toilets were emptied into a shaft,* while ventilating ducts at ceiling level were provided to remove the foul air. Leonardo de Vinci sketched an odourless toilet,

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*In Filarete's original plans, access to the lavatories was to be by trapdoors between the beds (Pevsner).

in which the whole toilet was mechanically closed off from the dung-pit when not in use.

7.4.3 *Sir John Harington*

Queen Elizabeth I was considered by her court to be extremely fastidious in matters of hygiene, taking a bath once a month "whether she need it or no". By comparison, her godson, the poet Sir John Harington, was considered eccentric in the extreme, because he had a bath every day. But Harington is not remembered for his bathing habits, but because in 1596 he designed the first valve water closet.(44)(46) He described an odourless toilet in the book *The Metamorphosis of Ajax* (1596). It incorporated all the main features of a water-closet — a cistern with operating lever and overflow, a bowl, flushing pipe, plug outlet valve and a seat. It was flushed from "a barrel of water placed in the room above, whence the water may, by a small pipe of lead of an inch, be conveyed under the seat... to which pipe you must have a cock or washer to yield water with a pretty strength when you would let it in." The bowl was closed by a plate at its base, and contained a few cm of water. After use, the plate was removed, and the contents of the bowl deposited in a drain beneath. Sir John installed one of the closets in the Queen's Palace at Richmond, and one in his house near Bath (Fig. 7.15).

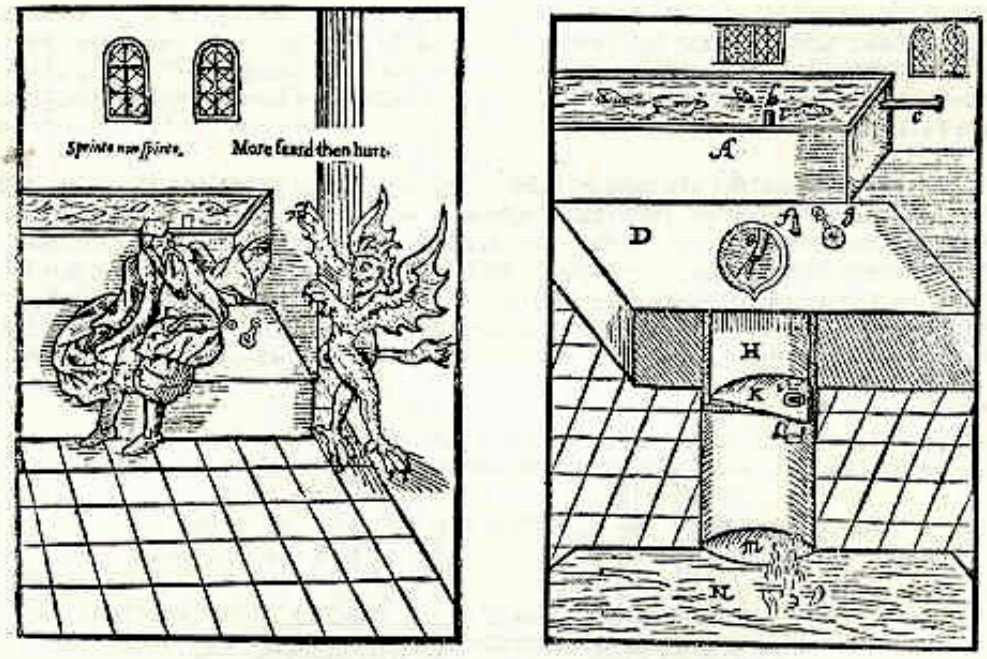

Fig. 7.15. Sir John's water closet.
(Courtesy, Science Museum, London)

However, there were two major practical difficulties to be overcome before the re-invention and wide adaption of the valve water-closet nearly two hundred years later. There were few drains or sewers in Elizabethan England, so the effluent would have to be discharged into a pit, unless the water-closet happened to be installed next to a river or stream. Moreover, water supplies were extremely limited.