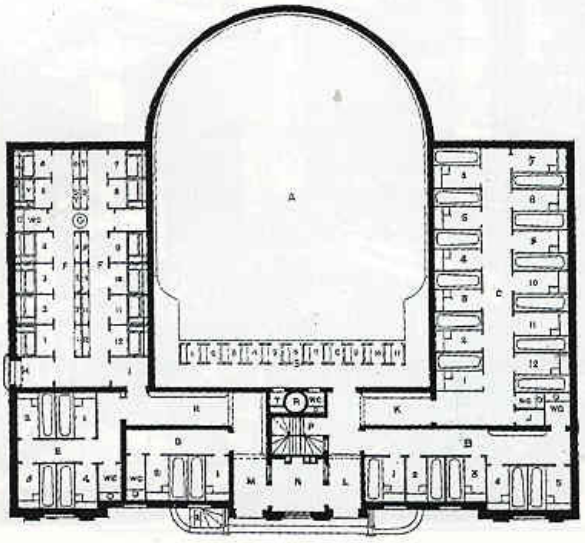
Public Health

In every house a WC may be considered a necessity. But by English people, lavatories and baths, fitted up with hot and cold water services, would I suppose, be considered a luxury.
The Plumber & Sanitary Houses, S S Hellyer, 1900.

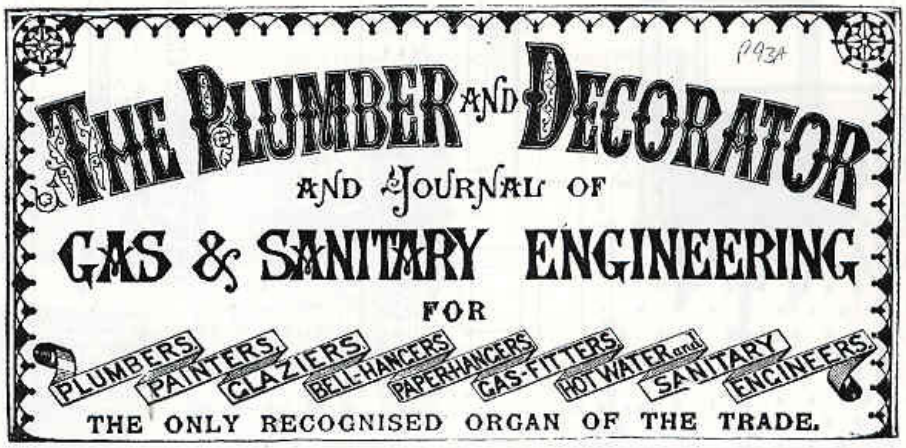


A. Swimming-bath
B. Five men's baths—first class.
C. Twelve men's baths—second class.
D. Two women's baths—first class.
E. Four women's baths—second class.
F F. Wash-house, twelve compartments.
G. Wringing machine.
H. Entrance to Wash-house.
I. Office.
J. Soap, &c.
K. Lobby.
L. Men's entrance.
M. Women's entrance.
N. Office.
P. Bath-keeper's entrance.
Q. To the stokery.
R. Chimney-shaft.
S. Dressing-boxes.
T. Urinal.
V. Wash-tub.
W. Boiling-tub.
X. Rinsing-tub.
Y. Drying-closet.
Z. Dripping-board.

158. *Design for Baths & Wash-houses, Bilston, Nr Birmingham. Baths & Wash-houses: An Account of Their History, A Ashpitel & J Whichcord, 1853, opp. p1. (Presentation copy CIBSE Archives).*

(The Quest for Comfort, Brian Roberts, CIBSE Centenary book, 1997)

See the privy house for easement be fair, sweet and clean,
And that the boards thereon be covered with cloth fair and green.
Book of Nurture, John Russell, c1460.



159. Trade Journal Masthead: The Plumber & Decorator, c1886. Plumbing, Centenary issue, No. 67, Autumn 1986, p33.

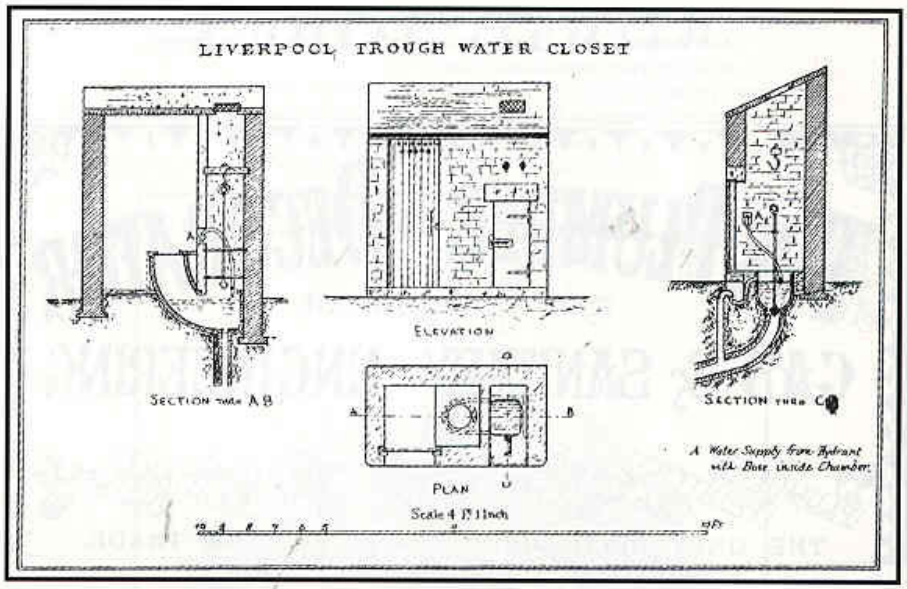
Public Health

Ancient Rome (4th century AD) had 11 public baths, 144 public lavatories, 1352 public fountains and cisterns, 856 private baths, an extensive system of overhead and underground aqueducts, and public sewers. It was the Romans who installed the first piped supplies of water in Britain leaving examples of pottery pipes (Lincoln), wooden pipes (Silchester) and lead pipes (Bath). After the Romans, the larger monastic houses collected water from springs or reservoirs and distributed it through pipes, one of the most elaborate systems being that at Canterbury Cathedral (1160). London obtained its first piped water supply from a spring at Tyburn, from where it was distributed to a conduit at Cheapside (1237). Later, a waterwheel at London Bridge, drove a pump to raise Thames water into a reservoir, from where lead pipes took it into the City (1582). The New River brought additional water into London from Middlesex (1613), but a comprehensive network of water mains (and sewers) had to await Victorian times.

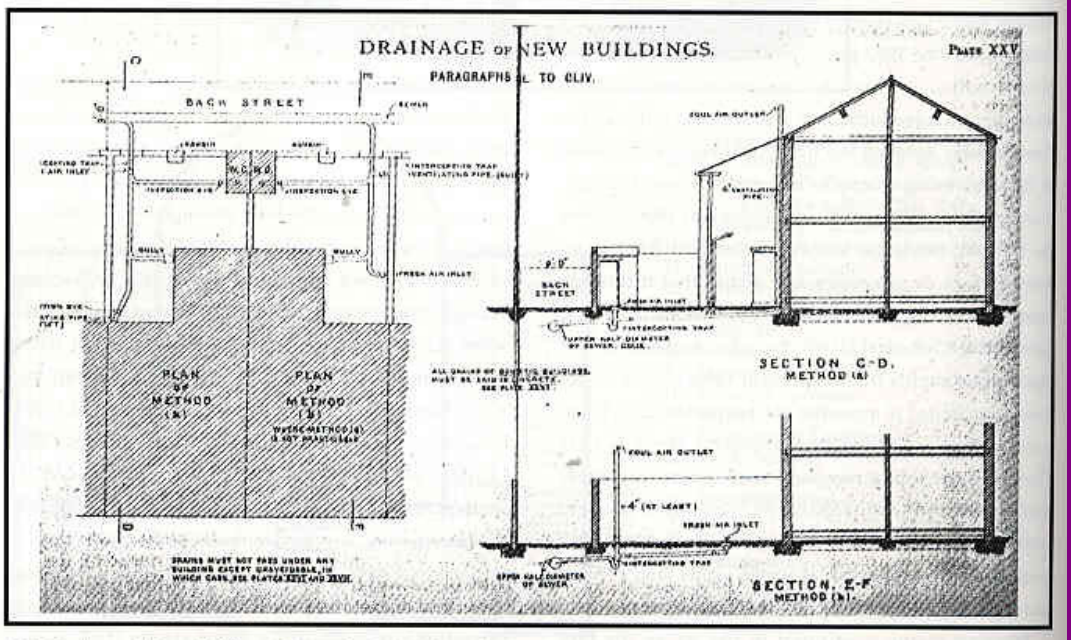
Wooden mains continued in use up to the 19th century, with lead connections into the houses. Gradually, other types of piping were employed: cast-iron (1745), steel pipes, pipes covered with a coal-tar composition against corrosion (Angus Smith, Liverpool, 1860) and concrete (1906).

The overcrowding and poor condition of many dwellings in London led to grossly insanitary conditions up to the mid-19th century. The privy, the cesspool and the night-soil collectors took care of most sanitation requirements. It was Sir John Harington who designed the first valve water closet (1596), but it was not a success due to lack of piped water supplies and sewers. Though other designs followed, the breakthrough came when Alexander Cummings patented a closet which incorporated a water seal (1775). However, it still took around another hundred years before the use of closets became widespread and names like Jennings **[162]**, Doulton **[163]**, and Crapper **[165]** spearheaded the sanitary revolution. In London, it was the construction of the intercepting sewer systems of Sir Joseph Bazalgette (1865) which stopped the wholesale discharge of sewage into the Thames. In places like Liverpool, it was the introduction of Building Regulations **[161]** which improved sanitary conditions.

Temples of Convenience, Lucinda Lambton, 1978.

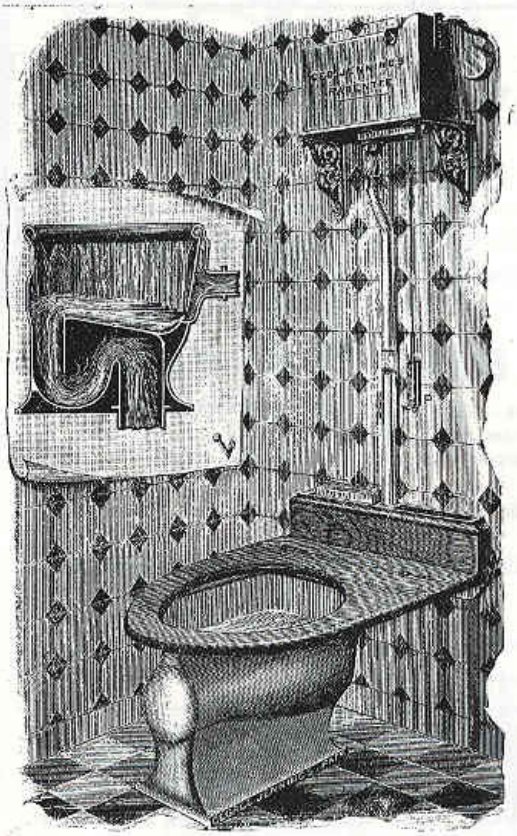


160. *Liverpool Trough Water Closet. The scavengers are employed by the Corporation, and every day they visit each of the trough closets, flush it out with water, sweep it clean and leave it charged with fresh water for the next 24 hours' use.*
[Privy Council Medical Officer Report 12, App.4 1870]. BSE:p340.

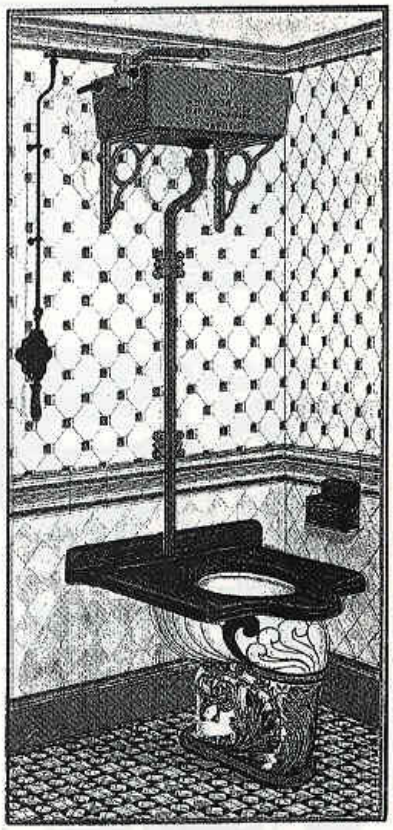


161. *Drainage of New Buildings, Liverpool. Section through a small, late 19th century house in Liverpool showing how it should be drained.*
[A Manual of Building Regulations in Force in the City of Liverpool, W Goldstraw, 1902].
The English Terraced House, S Muthesius, 1985, plate 4.

Tho' the pipes that supply the bathroom burst
And the lavat'ry makes you fear the worst
It was used by Charles the First
Quite informally
And later by George the Fourth
On a journey North.
The Stately Homes of England, Noel Coward, 1899/1973.



162. *George Jenning's Patent Closet. Described as a closet without woodwork (seat excepted).*
Standard Practical Plumbing, Vol.1, P J Davies, 1905, p203.

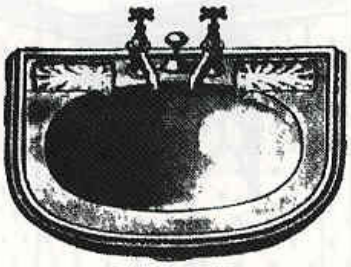


163. *Patent Vacuum Internal Closet. An overhead cast-iron cistern (chain-operated) with glazed earthenware wc bowl having a transfer applied pattern. Boxes of toilet paper were often included. Toilet rolls date from c1880.*
[Cat: Doulton & Co, London, 1887.]
The Elements of Style, 1991, p264.

164. *Trade Journal Masthead: The Sanitary Engineer, c1880. Later Engineering News Record, USA. Mechanical & Electrical Systems for Historic Buildings, G. N. Kay, 1991, p216.*

THOMAS CRAPPER & CO.'S

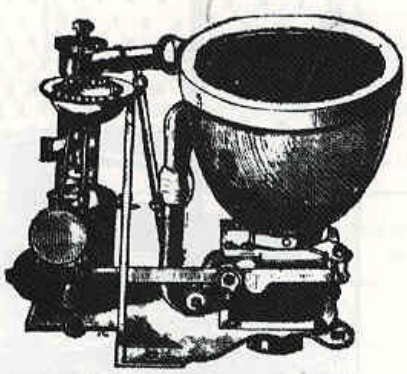
Sanitary Specialities,



IMPROVED

LAVATORY BASIN.

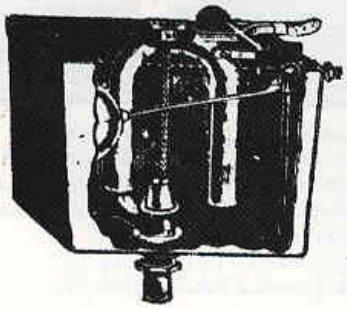
	£	s.	d.
White Ware, fitted with combined Overflow and Waste, and ½ Standard Screw-down Valves ...	2	19	6
Plated Fittings, Extra	0	8	6



ELASTIC VALVE CLOSET.

No. 78.—Valve Closet, with white china dish with gold lines, and handle, white ware flushing rim basin, 1 in. supply valve, copper air regulator, complete as shown.

		£	s.	d.
		£3	9	6
If with 1¼ in. valve	Extra	0	3	6
,, Ornamental Basin	,,	0	3	6
,, White and Gold Basin	,,	0	8	9
,, Box Enamelled inside	,,	0	4	9
,, Box fitted with Brass Top ...	,,	0	6	3
,, Box fitted with union to connect Ventilating Pipe	,,	0	3	9
,, 4 in. outlet	,,	0	7	9



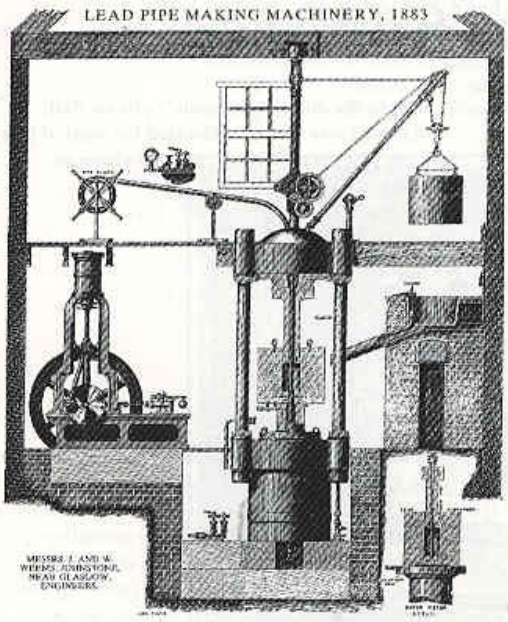
IMPROVED SYPHON

Water Waste Preventer.

	£	s.	d.
Cast-Iron 2 Gallon Syphon Waste Preventer, with Tranquil Inlet Valve, and Silencing Air Tubes, and Brass Chain and China Pull	1	1	6
Ditto, 3 gallon ditto	1	3	6

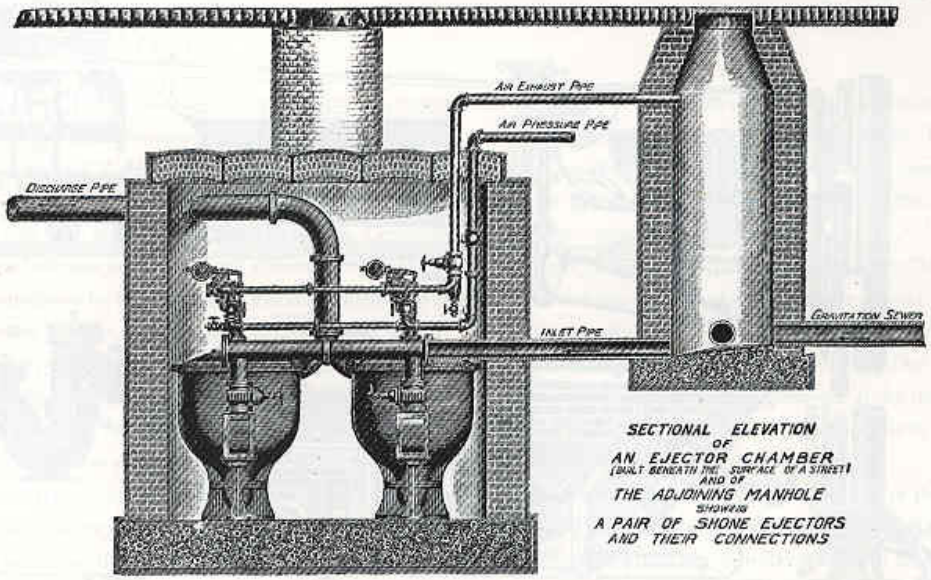
50, 52, & 54, MARLBOROUGH ROAD, CHELSEA, LONDON, S.W.

165. Advertisement: Sanitary Specialities. Thomas Crapper & Co, Chelsea, London, undated. Probably c1900. The History of Plumbing, Parts 1–8, Plumbing & Mechanical, Vol.10, No.4, p116, June 1993.

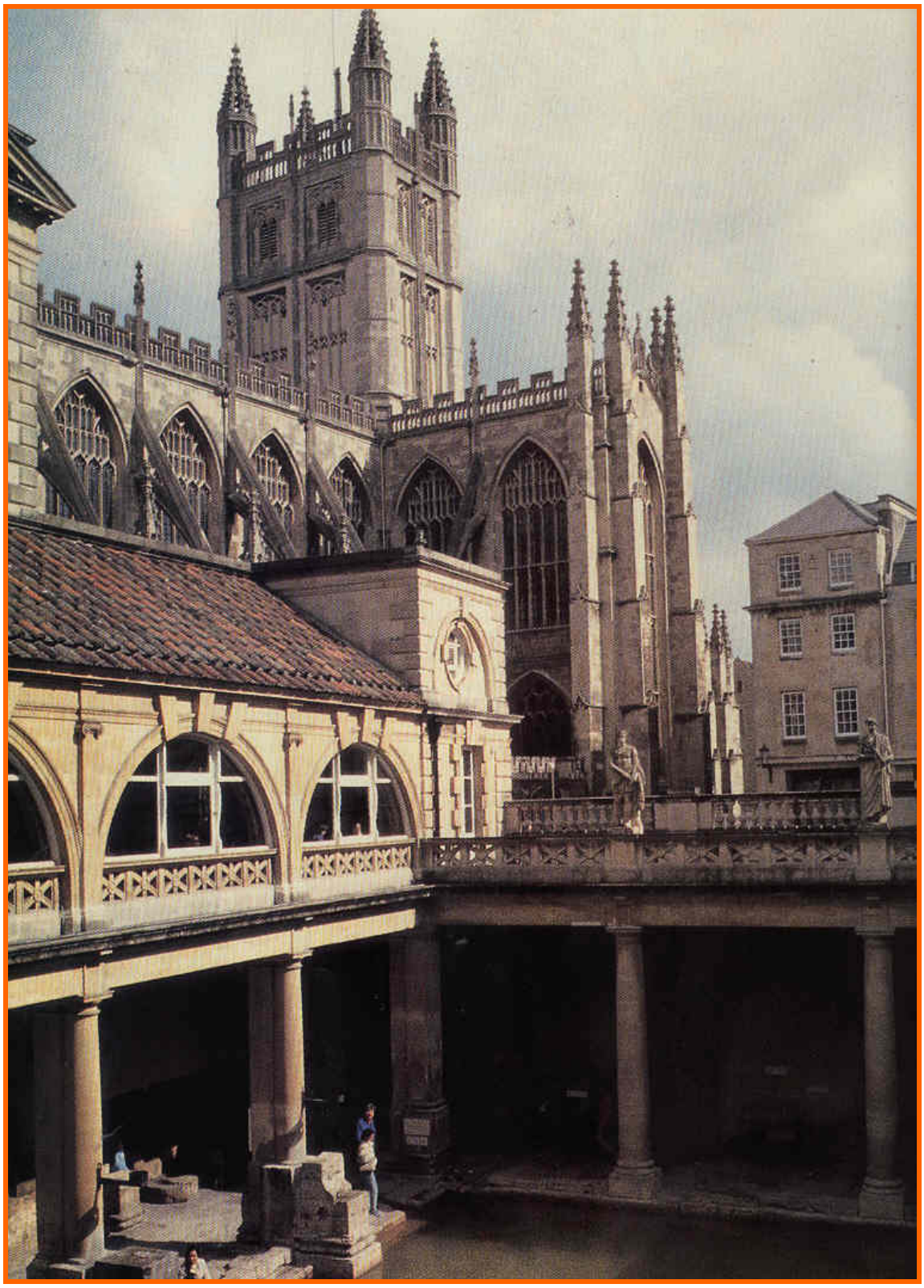


166. *Lead Pipe Making Machinery, 1883.*
The Engineer: Highlights of 120 Years, 1976, p172.

167. *Advert: Hot & Cold Water Tap, c1886.*
Palatine Engineering Co, Liverpool.
Plumbing, Centenary issue, No. 67, Autumn 1986, p40.



168. *Shone Pneumatic Sewage Ejectors. In 1886, a Select Committee of Parliament recommended that the drainage of the Palace of Westminster be pumped into the metropolitan system by Shone's ejectors and that the main sewer passing under the Houses of Parliament be reconstructed on the most modern approved principles. This was accomplished in 1889.*
Sanitary, Heating & Ventilating Engineering, Vol.II, 1921, p49.



The Roman baths in Bath date from 50 AD
(Plumbing & Mechanical magazine, USA, June 1993)

THE HISTORY OF PLUMBING—

OUR ROMAN & ENGLISH LEGACY

FROM PLUMBING AND MECHANICAL, JULY 1986

Testaments to the ancient plumber echo in the ruins of rudimentary drains, grandiose palaces and bath houses, and in vast aqueducts and lesser water systems of empires long buried. Close to 4,000 years ago, about 1700 B.C., the Minoan Palace of Knossos on the isle of Crete featured four separate drainage systems that emptied into great sewers constructed of stone.

Terra cotta pipe was laid beneath the palace floor, hidden from view. Each section was about 2 1/2' long, slightly tapered at one end, and nearly 1" in diameter. It provided water for fountains and faucets of marble, gold and silver that jetted hot and cold running water.

Harbored in the palace latrine was the world's first flushing "water closet" or toilet, with a wooden seat and a small reservoir of water. The device, however, was lost for thousands of years amid the rubble of flood and decay. Not until the 16th Century would **Sir John Harington** invent a "washout" closet anew, similar in principle. And it would take still another 200 years before another Englishman, **Alexander Cumming,** would patent the forerunner of the toilet used today. The luminous names of **Doulton, Wedgwood, Shanks,** and **Twyford** would follow.

But it's to the plumbing engineers of the Old Roman Empire that the Western world owes its allegiance. The glory of the Roman legions lay not only in the roads they built and the system of law and order they provided. It was their engineering genius and the skill of their craftsmen that enabled them to erect great baths and recreation centers, the water supplied by aqueducts from sources miles away.

Plumbing Defined: While early pipe and conduit was made from wood or earthenware, later refinement to lead made skilled workers in lead indispensable. The Latin term "plumbus" means "lead," as was also the weight at the end of a line for perpendicular alignment. The plumber was a worker in lead who, in today's connotation, repairs or fits the apparatus of water distribution in and to a building. The Roman artisan plumbed pipe, soldered, installed and repaired; he worked on roofs and gutters, down to sewers and drains; in essence, everything involving supply and waste. In fact, this general job description of plumbers' work lasted into the 20th century.

Hot and cold water systems were already developed by the Greeks, but to the stalwart, individualistic Spartan, it was unmanly to use hot water. His idea of the bath tub was a polished marble bowl about 30" in height. He would stand in the tub, and have a slave douse him with water over his head and his body. The sole purpose was a quick, functional, cold rinse—the colder, the quicker! Thus Grecian bath houses never developed hot water systems as extensively as the Romans.

Roman society, on the other hand, fostered a communal spirit, and barracks comradery for its troops. The public baths were the city centers of group enjoyment, places of gossip and contacts. To prolong their pleasure and relaxation, they developed hot water and steam systems that evolved to service colossal structures. Some would say that the Roman bath houses by early A.D. would pale only next to those of King Minos.

The baths of the Emperor Caracalla, for example, covered nearly a 28-acre site. It contained more than 1,600 marble seats, and still fell short of the baths of Diocletian, which seated over 3,000. "Stupendous aqueducts," reported Gibbons in the *Decline and Fall of the Roman Empire,* "replenished the Thermae, or baths, constructed with Imperial magnificence...walls covered with mosaics; perpetual streams of hot water poured into capacious basins through so many wide mouths of bright and massy silver."

Miles from the source of supply, water flowed through a series of aqueducts, streaming by gravity along the contours of land. The longest overhead section was about 14 miles long, but by 52 A.D., channeling covered a total of 220 miles—all but 30 miles underground. At its peak development, aqueducts carried about 300 gallons of water for every citizen.

At first, the Roman baths opened only during the daylight hours, which allowed for the emptying and refilling of the water at least once a day. This helped matters somewhat, in that hundreds would use the same pools of stagnant, germ-ridden, unfiltered, fetid water. The dawn of scientific discovery would not be for hundreds more years. Even the best and brightest of the ancient Romans knew nothing about bacteria and the true causes of disease.

The bath complex housed a succession of baths, with many entrances for easy access. Surrounding the complex on at least three sides were houses and shops.

Warm air for the Thermae bath was supplied by furnaces heating hollow bricks located under the entire floor. As the name suggests, the Frigidarium was the cold water bath; it fed the hot water tanks and other baths. The Tepidarium contained baths of moderate heat, and the Caldarium the hottest.

There was also a separate steam bath, and a small circular chamber covered by a high dome. An opening in the center of the dome provided light; it also vented the chamber. As a rudimentary way of regulating the heat, the vent could be raised or lowered.

One could take a hot bath in a tub or a plunge into cold water, but the tub was soon supplanted by a larger unit.

The bath measured 10-12 ft. in diameter, and was about 3 ft. deep. One

The Roman answer to the hot tub—50 A.D. Bath, England

stepped down into it on two marble steps. A circular seat about 10" from the bottom allowed the bathers to sit and wash themselves.

It was customary to bathe after exercise, and before a meal to promote digestion. As just one example of his fabled excesses, it was Nero's pleasure to bathe, gorge himself with food and fancy, bathe, etc., in his great catered affairs.

In the cold water bath of Pompeii, water was supplied through a bronze spout, and wound its way through a conduit on the opposite side. It was also equipped with a waste pipe which prevented the water from running over.

A marble platform surrounded the bath, with pedestals for statues. The ceiling was vaulted and lighted by a window in the center.

By the 4th century A.D., Rome would have 11 public baths, 1,352 public fountains and cisterns, and 856 private baths. In Pompeii, some homes had 30 taps.

As mentioned, the water supply was provided by aqueducts, the first one built in 312 B.C. Named in honor of its originator, Appius Claudius, it spanned a total of 11 miles. However, it marked a milestone as the previous water supply was only from the immediacy of wells, cisterns, springs, or the Tiber River itself.

As the city became more populous, and the Roman emperors more decadent and demanding, the engineering feats in water systems became increasingly monumental.

An artificial lake created for Augustus measured 1,800' long x 1,200' wide. One of his favorite spectator sports was watching actual battles between opposing fleets of ships, manned by criminals and slaves of the emperors. By Nero's time of 37-68 A.D., a "sea" fight for his amusement would utilize 19,000 men on 100 ships. They fought in gladiator fashion, i.e., until one was killed in combat, or spared by the emperor.

The English Connection: At the height of its power the Roman Empire had conquered most of Europe, including about 1,600 sq. mi. of Britain, its farthest outpost. And in the ruins of Aquae Sulis, the famed spas of Bath, lay the vestige of the rise and fall, and redevelopment of plumbing technique.

By the time the Romans reached Britain in 43 A.D., the curative powers of the hot baths were already part of English legend. Back in 863 B.C., the waters had supposedly healed the leprosy of its Celtic discoverer, Prince Bladud (the father of King Lear, who was to be immortalized by Shakespeare). Bladud founded the city of Bath, and dedicated the springs to the goddess Minerva. The Roman name of Aquae Sulis means "Waters of Minerva."

Aquae Sulis was at a strategic crossroads for the Roman troops, and the natural hot springs made it a logical setting for the baths of the Emperor Claudius. In addition, the springs produced a constant supply of soothing mineral waters, heated by Nature to a temperature of 46.5°C. Important too was that available sources of building stone and lead were close by.

Following Roman custom, Claudius developed Aquae Sulis in the image of the great baths back home, but scaled in size to its smaller location. At that, the complex must have comprised approximately 23 acres.

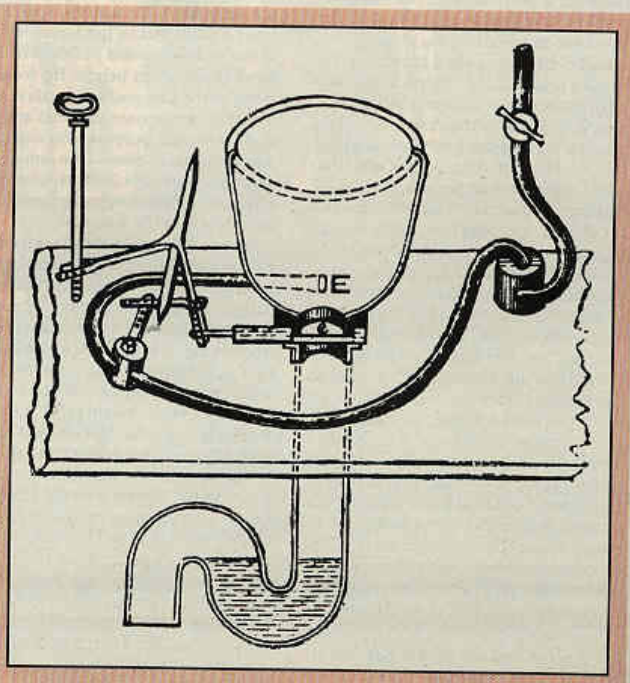
One monumental hall led into another as the floor plan radiated to various heated rooms, steam rooms, baths and swimming pools, plus a gymnasium and social rooms for eating and drinking. A playfield was attached to the complex as well.

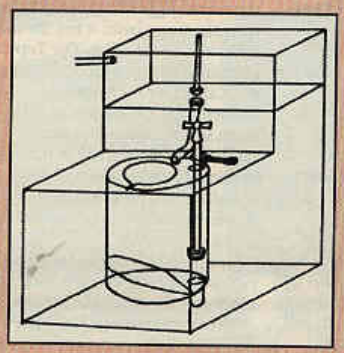
The small, circular pool was probably built for women and children, who at first used the pool only at stated hours and separate from the men. But eventually regulations broke down and both sexes intermingled throughout the pleasure complex.

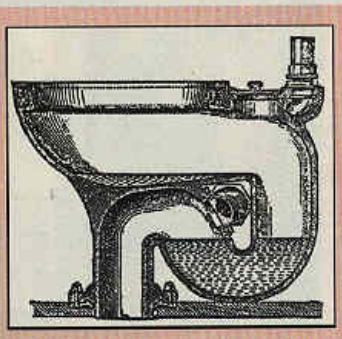
The Romans controlled the site for about 500 years, but their influence floundered, waned and just about expired in phase with the decline of the

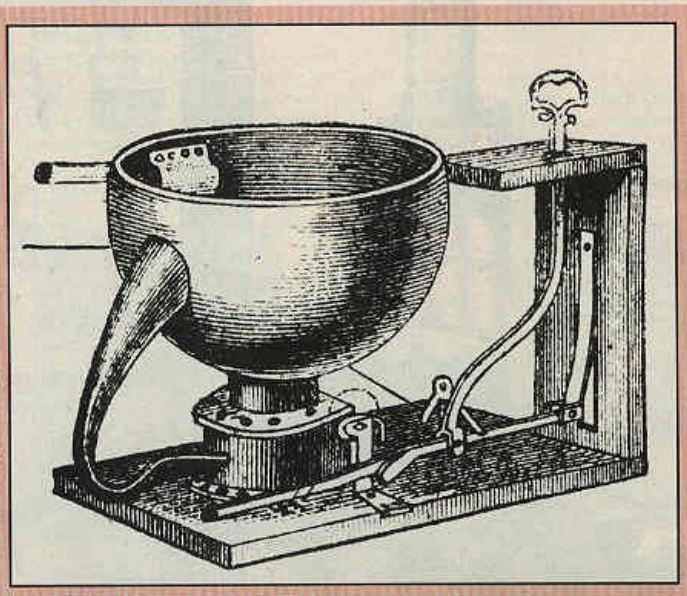
Right: The first notable toilet design was by the "father of the modern water closet," Alexander Cumming. He announced his patent in 1775. The bowl held water by means of a sliding valve underneath. The lever operating the valve admitted water from the cistern. Cumming's "soil pipe" was really an S-trap offering a certain syphonic action.

Below: In 1595 Sir John Harington installed this closet in his home. It was called the "Ajax"-a pun for "a jakes," common words for a toilet back then.









Above: An example of a late Victorian washout closet. This closet had a shallow basin with a dished tray and a water seal. The flush water drove the contents into the main body of this tray, into the main body of the pan, and through the S-trap. J.G. Jennings, a sanitary pioneer, patented such a closet in 1852. Famed potter Thomas Twyford was a leading promoter of this design during the 1870's.

Right: In 1778, Joseph Bramah patented a closet which had two hinged valves. The first valve introduced water from a cistern; the second water for the bowl eliminating odors from the soil pipe, drains or cesspool. Pottery manufacturers thought it used too much brass, and would be unprofiable as china.

Empire, whose ruination became complete by the sixth century A.D. By then Roman garrisons in Britain had been invaded by hordes of Picts, Saxons, Scots and Irish, and could count on no help from Rome, which was in trouble itself. When the last Roman garrisons fled the isle of Britain, the secrets of sanitary design went with them.

Replacing them were the Barbarians, leveling cities and decimating populations as they hacked their way across the continent. Civilization reeled and regressed. Sanitation technology reverted to its basest forms.

The early Christians rejected most anything Roman, including the value of cleanliness. They considered it unsaintly to be clean, sinful to display material wealth. "All is vanity," stated an early Christian writer. St. Benedict pronounced that "to those that are well, and especially for the young, bathing shall seldome be permitted." A 4th-century pilgrim to Jerusalem would brag that she had not washed her face for 18 years so as "not to disturb the holy water" used at her baptism.

By the Middle Ages, the "hot houses" or "stews" of the Roman baths carried the stigma of debauchery and wild parties. During the reign of Richard the Lionhearted, the little rooms or "bordellos" of the baths became synonymous with brothels.

In 1348 the first wave of Black Plague entered England through the town of Melcombe in Dorset County. One third of the population would be wiped out, as rats and fleas thrived in the filth and garbage steeped in and about and all around.

The Dark Ages had begun.

The Recovery: The spas of Aquae Sulis lay dormant, buried under rubble and dirt, and unappreciated for centuries before being restored to use. In the 16th century, the Cross Bath was "worthilie called the hot bath, for at the first coming, men thinke that it would scale their flesh, and lose it from the bone, but after a season...more tolerable and easier to be borne."

Cartloads of wood or coal provided the fuel for the warm-air furnaces, especially for the hottest room with its sub-floor heating. The Great Bath, which measured 80' long x 40' wide and 6' deep, was still supplied water from the original conduit installed by the first Roman plumber in town.

In the 18th century it was the rage to drink copious glasses of water from Bath's pump room, located next door to the bathing room. According to one account, ladies of the Blunderhead family allowed their servant girl, Tabitha Runt, to bathe in the waters next door while they drank their water at the pump. In those days servants bathed even less than their masters, who bathed hardly at all. Those were the days of perfume, powders and oil, not of soap and clean water. The following doggeral catches the tone of the age:

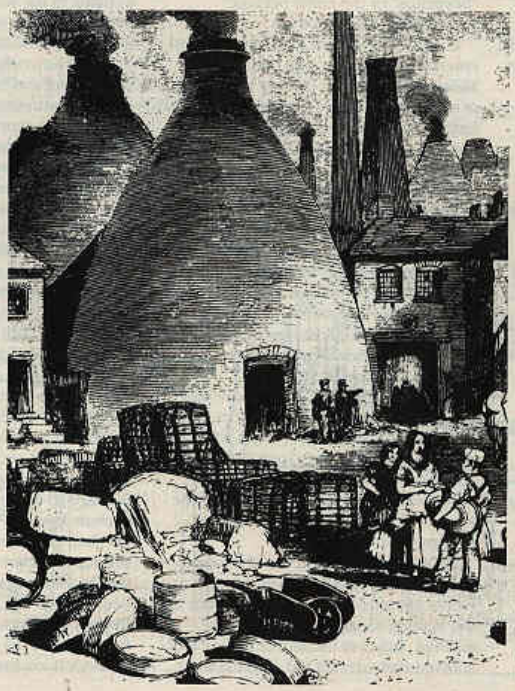
You cannot conceive that
a number of ladies
Were washed in the water
the same as our maid.
So while little Tabby
was washing her rump,
The ladies kept drinking it
out of the pump.

It was not until the activities, and public relations, of the dandy Richard "Beau" Nash in the 18th century that Bath reclaimed its luster.

Nash was a celebrity of his day, a nobleman gambler who set the rules of behavior that proved fashionable for the era. The social whirl was comparable perhaps to the "jet setters" of our current age who seem to do nothing but get their pictures in magazines, and help sell supermarket tabloids. The little town that had sprung up around the baths became the "in" place of royalty and the upper class, sort of a trendy "hangout" for Nash and his crowd. The Bath Address Book listed such dignitaries as

Above: Scene from the Sanitary Ceramics Gallery of the Gladstone Pottery Museum, Longton, Stoke-On-Trent, England. Fixtures date from 1850-1870.

Far Right: Examples of ornate Victorian closets at the Gladstone museum.



Queen Anne and Thomas Gainesborough, and the showrooms of the great potter, Josiah Wedgwood.

In 1780-81, the future Admiral Lord Nelson spent some of his youth in Bath, and later paid occasional visits. After one visit to recuperate from battle wounds, he wrote: "My health, thank God, is very near perfectly restored, and I have very near the perfect use of my limbs, except my left arm."

The baths were back in business. When it happened, their reputation for healing had been embellished beyond even Roman legend. The waters would be touted as "good for obstructions, still more: ague, dropsy, black and yellow jaundice, schirrus binis or hard swelling of the spleen, scurvy, greensickness, whites in women, and defect and excess of their course."

Left: This original drawing shows the Gladstone pottery bottle kilns, typical of 19th century potteries including Twyfords, Royal Doulton and Wedgwood. All made plumbing fixtures at one time. Twyfords still does.

Waste And Sewers: Where and how to dispose of waste and sewage have been the bane of Man since the beginnings of time.

While early on he recognized the value of camping downstream to let "running water take its course," the problem of disposal became acute as populations proliferated and banded together.

Aristotle instructed his prize pupil, Alexander the Great, to make sure that dung from animals, human waste, etc., was disposed of far from camp. Predating his words by about 3,000 years is the Old Testament injunction that stated: *Thou shalt have a place also without the camp, whither thou shalt go forth abroad. And thou shalt have a paddle upon thy weapon; and it shall be when though silt ease thyself abroad, thou shalt dig wherewith, and shall turn back and cover that which cometh from thee.* (Deuteronomy 23)

But for a workable, though odoriferous, plan on a grand scale, the Western world will have to again look to the ancient Romans.

The first sewers of Rome were built between 800 B.C. and 735 B.C., preceding the first aqueduct by about 500 years. Called the Cloaca Maxima, this sewer is one of the largest of the ancient sewers still in use. It was designed to carry off the surface water, and otherwise provide drainage for the entire city.

It was said that every street emptied into a channel of the sewer. However, only a few privileged patricians or noblemen had outlets to their houses. These were but extensions to their latrines located adjacent to their kitchens. As the untrapped ends of the sewer were the only sources of ventilation that the sewers had, noxious fumes expelled into the immediate area and wafted about. One wonders what the "smell" of "good cooking" really meant in those days.

By 14th century England, the problem was still unsolved. Culled from an old record, one reads that "the refuse from the king's kitchen had long run through the Great Hall in an open channel, to the serious injury to health and danger to life of those congregated at court."

Further complications resulted from medieval privies or the euphemistic "garderobes" (wardrobes for undressing) located in the "Great House" or castle. The chamber would be in a small vaulted room about 3' wide with a narrow window. The privy was built within the wall, with a vertical shaft below a stone for a wooden seat. The waste would discharge into the moat below. If there were no water, the receptacle might be a barrel or a pit. In either case, it was a deadly chore to rake the offal. The job paid top wages for brave but desperate men needing to work. A crew of 13 men were paid three times the normal rate to clean the pit at Newgate Jail in 1281. It took them five nights.

But pity the plight of one Richard the Raker. He fell through the planks of a public latrine and drowned in the deep pit of excrement below.

Underground channeling was a haphazard arrangement as well. Drain tiles, constructed from the "roughest brickwork" or masonry, were 12" in cross section, made by laying flat stones to form the bottom of the drain. Then brick walls were built up, and topped with flat stones.

The drains were built helter-skelter with no understanding of purpose. Some would be too big or too small, or running uphill or at right angles, etc.

The possibility of disease being transmitted through water and waste began to chip through centuries of ignorance. Scientific discoveries began to unfold. Some would even believe that an open cesspool was "the probable cause of headache, sore throat and depressed health to many a cook, kitchen maid and butler, and perhaps indirectly leads, in not a few instances, to the use of those treacherous self-prescribed medicines—spirits and beer."

Stinks, Pots, & Loos: The rivers of the Thames, Fleet and Walbrook were open sewers, the Thames the most foul of all. The abominable odors of the Fleet, complained the monks of the White Friars, have overcome the frankincense burnt at the altar"; they claimed the fumes caused the deaths of several brethren. Sherborne Lane, once a lovely stream back in 1300, was to be more popularly known as Shiteburn Lane. However, these were minor when compared to the state of the Thames.

No longer could a king's polar bear catch salmon in the Thomas River, as did the pet of King Henry VIII. By the mid-1800s, the by-products of the Industrial

[Roman & English Legacy]

Revolution were flowering, mixing, and foaming with the waste and stench of nearly 3 million people in London. All sewers led to the Thames, pouring through bulkheads along the shores.

For several sultry days in 1859, the Thames seethed, seeped, and nearly boiled under the burning sun of an unusually hot season. Parliament was suspended as window blinds saturated with lime chloride and other disinfectants failed to subdue the odor and revulsion.

It was so revolting that one foreign newspaper bannered twin headlines to catch the calamities of the day: "India Is In Revolt, and The Thames Stinks."

Personal hygiene fared no better under such a dead-end sanitary system. Tenements swarmed with people, but there were no indoor "necessaries" for them, not even running water.

Water was drawn from pumps stationed in streets throughout the city, the water rationed and serving hundreds of people. The pumps were open only during certain hours of certain days, the water to be carried home in pots or jugs, or just tasted in a pittance of a sip.

The finer homes may have had a tin or copper bath tub. But in the early 1800s piping was still confined to the first floor, the water heated by kettles over an open fire.

Tenements loomed several stories high as space was at a premium. The buildings were erected in long rows, back to back, containing tiny-room apartments with little or no ventilation (landlords were taxed for windows). Dank and putrid latrines, if any, were on the ground floor.

Inside the house or apartment, waste was stored in a glass urinal or metal chamber until filled. Tenants usually disposed of the contents by tossing them out the doors or windows.

Injuries caused by the far-flung contents of the chamber pots, or "missiles of mirth," as the ancient Greek dramatist, Aeschylus, would call them, persisted through the ages. Early Roman law included the Dejecti Effusive Act, which fined a person who threw or poured anything out of an open window and hit someone. The law awarded damages to the injured party. Strangely, the statute applied only during daytime hours.

The habits of people remained basically the same, and the problem continued well after the Romans left England. King Richard II followed suit with his writ of *Statuto quo nul ject dung*, "A writ that no one is to dump dung." This earliest of health laws was finally repealed in 1856.

Proper manners would prescribe warning unwary pedestrians that a shower was on its way. Thus the cry of "Gardez l'eau" (pronounced *Gardy-loo*, and meaning "Watch out for the water!") would echo up and down the streets. Over time it evolved into English slang for the toilet, or loo.

The chamber pots of the working class were usually made of copper, although later ones might be of crockery. The chamber pots for the rich and royalty were solid silver, the kings' ornate and pretentious. James I had a portable "potty," which he used for traveling. All the chamber pots, of course, were carried and emptied by servants.

Paranoid about being poisoned, James I had one encased in a leather box and

[Roman & English Legacy]

locked shut with a key. Edward VI had a padded chamber pot, and the "close stool" of Henry VIII was padded in black velvet, trimmed with ribbons, fringes, and quilting, all tacked on with 2,000 gilt nails. The Victorians of the last century, the "wizards of gadgetry," invented a musical chamber pot that played when the hidden drawer in the table or commode was opened.

The Necessaries: But for sheer invention, there is the relic of **Sir John Harington's** "Ajax" water closet, the first "necessary" ever built in English history. He built the toilet in 1596 for his godmother, Queen Elizabeth I (immortalized as the queen who took a bath once a month "whether she need it or no"), and installed it for her use in Richmond Palace. Although the Queen did use it, the toilet and Harington were subject to ridicule and derision. Harington never made another. It would be another 200 years before the idea took hold again.

The first patent for a "modern" toilet belongs to Alexander Cumming, who invented the "S" trap in 1775. It had a sliding valve underneath to hold the water. Three years later, **Joseph Bramah,** a locksmith and engineer, patented an improved version with two hinged valves. An original is still used in the House of Lords. The "Bramah" also became a prototype for closets on boats and ships.

The Good Life: In 1848, England passed the national Public Health Act, which would become a model plumbing code for the world to follow. It mandated some kind of sanitary arrangement in every house, whether a flushing toilet, or a privy, or an ash pit. The government also released 5 million British pounds for sanitary research and engineering, and began to build a sound sewer system. Now that there would be outlets for toilet systems, their manufacture made sense.

With this new incentive for invention, pottery makers including Josiah Wedgwood, Thomas Twyford, and John Shanks began to team with the inventors as they replaced brass and metal workings of Bramah's invention with all ceramic parts.

By 1858, **George Jennings** had popularized public lavatories. He had introduced the novelties by installing them in the Crystal Palace for the Great Exhibition of 1851; over 827,000 people paid to use the "necessary convenience."

By 1870, Thomas Twyford's improved version of the Bramah contained no metal parts, and Bramah fell out of production. And, although Jennings' pedestal vase toilet of 1884 won the Gold Medal at the Health Exhibition, it was Twyford who is credited with the revolutionary design of a one-piece toilet.

Before, a toilet was built in two parts: the top part a bowl, and the bottom half holding a separate pan. To keep the two together, the entire unit had to be contained within a wood box. The box would leak at the joints, and the smell would be terrible.

In 1885, Twyford pioneered the first trapless toilet and built the "Unitas" as a one-piece, free-standing unit on a pedestal base. This eliminated the problem of leaky joints and foul odor.

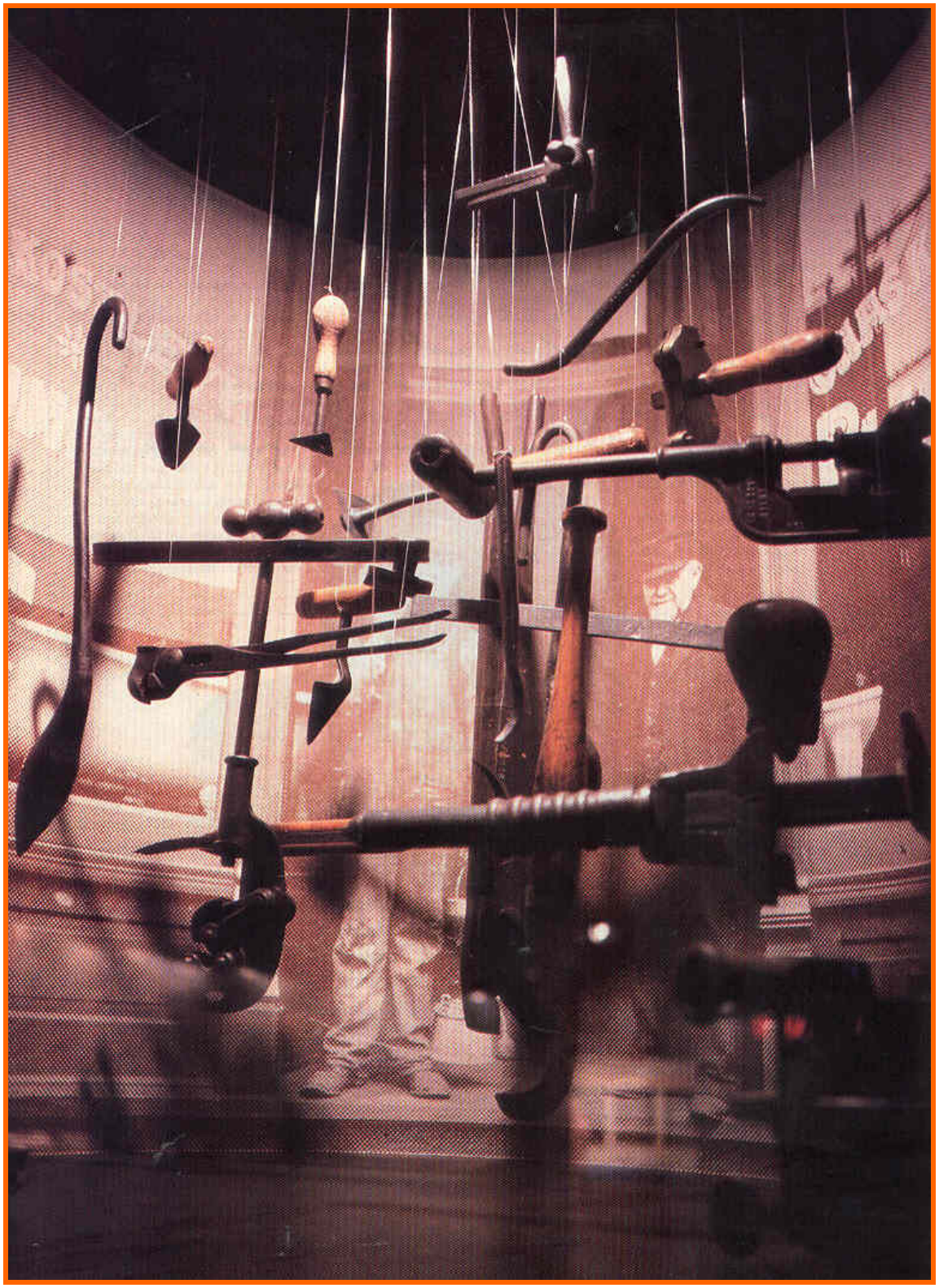
Tests for quality control were very basic: Jennings, whose toilet was judged "as perfect a sanitary closet as can be made," tested his unit by throwing in 10 apples 1-1/4" in size, one flat sponge and four pieces of paper. If the items cleared, the unit was pronounced fit.

John Shanks devised a different test for his units. He would throw a cap into the bowl and pull the chain. When the cap disappeared, he would cry out, "It works!"

Acceptance of water closets came slowly at first. But as closets became better made, and as proper connection eliminated disease, production grew. But there were still sporadic cases of typhoid in the second half of the 19th century. One of the most notable cases affected the royal family. Queen Victoria's husband, the popular Prince Albert, had died of typhoid in 1861, as almost did her son, the future Edward VII, ten years later.

In 1871, the Prince of Wales lost his groom, a friend, and almost his life to an outbreak of typhoid in Londesborough Lodge where he and his friends were staying. His groom died as well as his friend, the Earl of Chesterfield. Investigation proved contamination in the plumbing lines, and the problem was corrected and eliminated.

The craftsmanship of the 19th-century sanitary engineer had come almost full-cycle from the days of King Minos. In tribute, the Prince would be quoted as saying, "If I could not be a prince, I would rather be a plumber." **PM**



Chicago Science & Industry Museum exhibit of plumbers' tools

THE GOOD OLD DAYS OF PLUMBING IN AMERICA

FROM PLUMBING & MECHANICAL, JULY 1988

By the 1880s, indoor plumbing was a prominent feature of better homes and row houses. That wasn't necessarily good news, however.

Drainage was unsanitary, venting and trapping unknown. House drains frequently would be buried under cement by home builders who didn't know what all this newfangled plumbing was all about. Soil pipe lines ended at the fixtures instead of extending to the roof and venting to atmosphere.

Being wealthy enough to afford indoor plumbing during that era wasn't as much of a status symbol as one might imagine. To be sure, it added a certain dimension of convenience to life—most welcome, of course, on a frigid winter night.

But the homes stunk! And there were serious questions raised by people of high stature whether their health might not be threatened by indoor plumbing. Most of their concerns were about sewer gas, which was widely believed to be the source of disease. It would not be proven conclusively until 1909 that sewer gas was not the direct cause of bacterial infection, but the misleading research served a useful purpose of sparking demand by homeowners for better, safer plumbing systems.

The true heyday of good, safe plumbing in America occurred from 1880 on. Much of the credit must go to the pioneering sanitation engineer **George E. Waring, Jr.** A landmark book of his published in 1876, *The Sanitary Drainage of Houses and Towns*, sparked many municipal reforms in public health, building codes and sanitation systems. Waring also wrote numerous other articles and books geared to homeowners that dispelled their fears and instructed them how to ensure safe and healthy indoor plumbing.

Major urban centers like New York, Philadelphia and Boston enacted comprehensive codes to govern the sanitary arrangements of buildings. Governmental efforts to develop plumbing systems were propelled along by homeowners who began to seek advice on proper plumbing, repulsed by the stench of sewer gas emanating from faulty drains.

In 1881, New York State led the nation in requiring the registration of plumbers, as well as Board of Health supervision of all new plumbing installation. This was accomplished through prior submission and approval of plans and examinations of completed work.

In a research paper titled "The Plumbing Paradox," Columbia University's **May N. Stone** observes that "an examination of water service, drainage and fixtures in New York City row houses built between 1880 and 1885 reveals that during this five-year period the plumbing arrangements changed from an unsafe state to a fairly safe and sanitary one as a result of agitation and legislation."

Growing Pains: The fits and starts of plumbing sanitation was mirrored by the growing pains of the plumbing industry as a whole, and most of all, the plumber.

Even then, the plumber's reputation suffered because of the antics of unqualified jacklegs. In the 1870s, the plumber was reviled, the term synonymous with "cheat," according to May N. Stone. (The terms "plumbing" and "plumber" were used on only a limited basis in the 19th century, reports Stone. "Fitters, lead workers" and other synonyms were more common. The *Encyclopaedia Britannica* did not include plumbing in its listings until 1911, at which time the trade was described as "work...done for the purpose of fitting up and maintaining water service, gas service and drainage in a building.")

The problems of the plumbing profession were not of its own making. Unlike today's trade, the original plumbers were mechanics with virtually no knowledge of the health and sanitation implications of their work. Of course, how could anyone expect plumbers to know of those things when medical science was still debating the role of microbes and sanitation was just coming into its own as an important engineering specialty.

Even in the mechanical end, early standards and regulations were poor to nonexistent, allowing virtually anyone to pass himself off as a plumber. "A plumber's license simply conferred upon him the right to open the street and make sewer connections, a small bond having been given as an assurance that he would restore the pavement; no license whatsoever was required for work within a house," writes Stone.

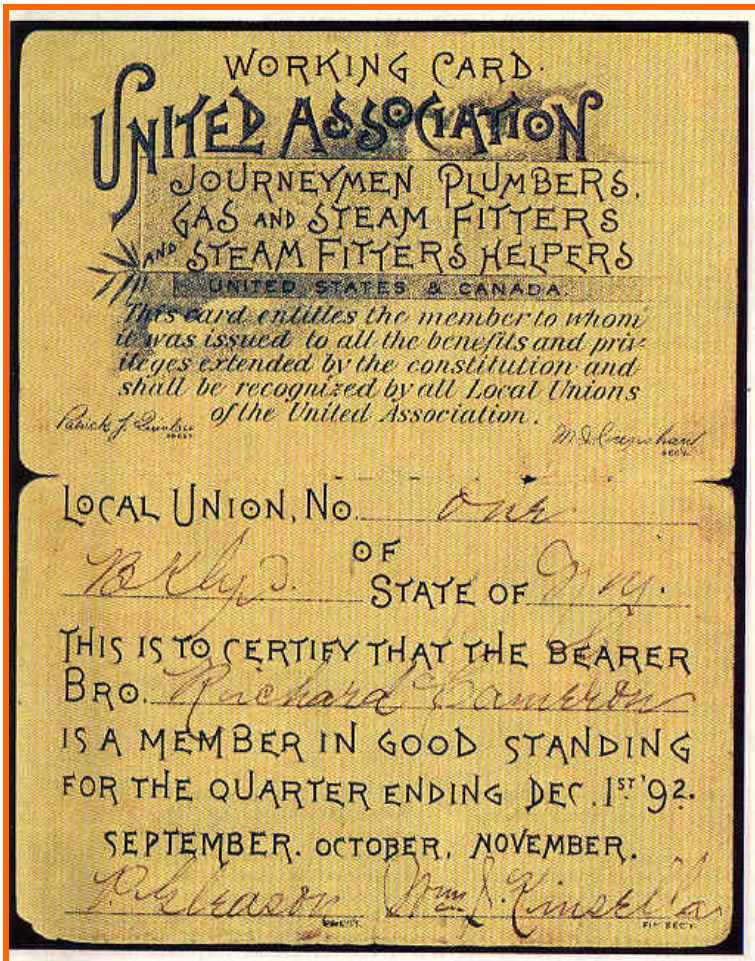
The plumber of yesterday also was befuddled by constant refinements in material, fixture design and piping arrangements, and requirements that changed from year to year. A house built in 1883 and passing muster to then-current specifications might be condemned as faulty five years later.

Towards Professionalism: Sanitation knowledge inspired sanitation reform. Citizens at large demanded improvements in municipal water supply and sewerage systems, and better plumbing systems in homes. And in more homes. Only a few more years would pass before American manufacturers would produce closets on a grand scale, equal to or better than their English prototypes.

It was time for the industry to get its act together. The need for education, cohesion, organization and standards gave rise to the formation of the plumbing industry's three most important

Chicago Museum of Science and Industry exhibit.

(Plumbing & Mechanical magazine, USA, June 1993)



WORKING CARD.

UNITED ASSOCIATION

JOURNEYMEN PLUMBERS, GAS AND STEAM FITTERS AND STEAM FITTERS HELPERS

OF THE UNITED STATES & CANADA.

This card entitles the member to whom it was issued to all the benefits and privileges extended by the constitution and shall be recognized by all Local Unions of the United Association.

Patrick J. Dunbar PRES. M. D. Cruickshank SEC'Y.

LOCAL UNION, NO. One

N. Y. C. OF STATE OF N. Y.

THIS IS TO CERTIFY THAT THE BEARER BRO. Richard Tomkins

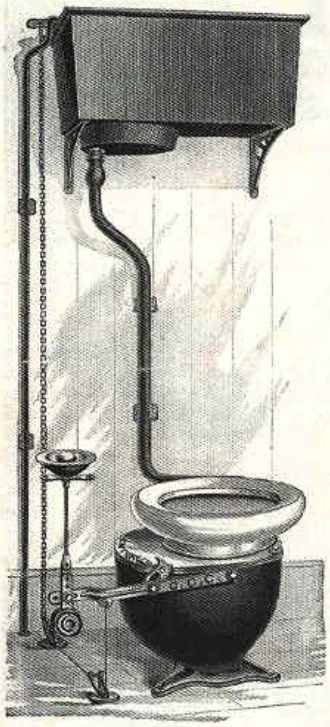
IS A MEMBER IN GOOD STANDING FOR THE QUARTER ENDING DEC. 1ST '92.

SEPTEMBER. OCTOBER. NOVEMBER.

P. Gleason BUS. AGT. Wm. J. Kinsella FIN. SEC'Y.

***Left:** One of the earliest union working cards issued by the United Association.*

***Below:** This "Century" cistern closet, complete with cistern and bowl, cost $15.45.*



institutions that still exist today: The National Association of Master Plumbers (now NAPHCC) in 1883; the Master Steam and Hot Water Fitters Association (now MCAA), in 1888; and the following year, the United Association of Journeymen Plumbers, Gas Fitters, Steam Fitters and Steam Fitters' Helpers of the United States and Canada—the UA plumber's union.

There were various reasons why all of these groups were formed, including economic advantage and to grapple with labor relations. However, their most important legacy is training and education. The apprenticeship system was being organized, and an important philosophy injected into it, best expressed by master plumber **James Tucker** of Boston.

As reported in *A Heritage Unique*, the official history of NAPHCC, Tucker delivered an essay titled "The Proper Education of the Plumber" at the 1884 convention, in which he argued:

"No plumber can keep abreast of his trade if he educates his hand alone. The skilled hand is a good thing in its place, but without the educated eye...it will not permit the plumber to keep pace with the age. A knowledge of joint-wiping and trap and pipe-fixing is good so far as it goes, but it is not of much avail apart from a knowledge of sanitation in plumbing. The principles of hygiene, the subject of hydraulics, and so forth, are of the first importance if you would be a sanitary plumber."

Expanding Role: The plumbing trade rapidly came up to snuff. A craftsmanship ethic took hold that enabled American plumbers to finally call themselves that with pride. It was plumbers, not engineers or product designers, who began venting and trapping fixtures. The new Irish and German immigrants became the backbone of the industry, bringing to America their work ethic and skill in the mechanical crafts.

A well-trained plumber of the late 19th century learned his trade through apprenticeship or perhaps from serving as a plumber's helper. According to the *Gasfitters' and Plumbers' Companion*, an early trade publication, he usually owned his own tools. Included in his carpetbag would be a solder pot, ladle, cloth, shave hook, turn pin, chipping knife, dresser, hammer, saw, wrench, pliers, and several minor tools.

Union plumbers in St. Paul could expect to earn $3.50 a day for "first-class men" and $2.50 for "second-class" men, reported the first edition of the *United Association Journal* of October 1, 1892. A standard work day was eight hours, so figure a union wage at roughly 44¢ an hour.

With winter setting in and recession taking hold, reports of work varied around the country and Canada. Bad news from Toronto was that two thirds of UA plumbers were unemployed, and the weekly hours were cut. Those who were lucky enough to get jobs worked "only" eight hours a day, "only" till noon on Saturday. This made "only" a 44-hour week.

Times were bad in Milwaukee, too, but plumbers were hopeful that new

buildings would be going up soon. Milwaukee Local No. 785 was working eight hours, "the wages are good, although no scale has been adopted as yet," report the *Journal*. From Columbus, work was also "dull," but there was a bright spot. The state Board of Health promised support for a law governing plumbing and inspection. There still were no "practical" men as inspectors.

The *UA Journal* showed a balance of $420.80 on hand as of Sept. 1, 1892, and counted 4,806 members on the UA books. The 96 locals were spread out over 30 states and two provinces of Canada. It wasn't bad for a fledgling association organized a few short years before.

Ten years later, in 1902, a successful strike in Terre Haute, Indiana, resulted in an increase in wages of 5¢ an hour. From $3.85 for a day's work, or 48¢ per hour, the union plumber now could expect to receive 53¢ per hour, or $4.25 for an eight-hour day.

Spiraling inflation made news, too. The *Journal* printed an item stating that while wages had increased 4.3% during 1890-1899, the cost of living had jumped ahead at the rate of 8%.

Grassroots Gripes: The *Journal* printed letters from the various locals. They were rife with reports of lockouts and strikes, and castigation of "industrial spies" and "scabs." Plumbing was advancing, but labor relations were still mired in the Dark Ages.

Plumbers complained about politics and plumbing inspectors. Plumbing inspectors were not "practical plumbers," complained one disgruntled UA member. And what's worse, they "are subservient to the municipal ring." Plumbing laws were not being enforced and unsanitary conditions resulted.

And Brother Doyle wrote from St. Paul, "The worst evil we have to contend with is the indiscriminate selection of apprentices...without regard to their fitness. A large number comes from the toughest element in the city...well versed in the slang of the street, but their education has been sadly neglected in other respects.

"After working a year or two," Doyle goes on, "the employer urges him to wipe a joint ('swipe a lump' is what the boy calls it), and then he will get a dollar or two added to his wages in the week and a kit of tools." The apprentice then quits the employer after awhile, and is given the tools, "including that double-back-action, adjustable tool called the helper...He's sent out jobbing and an innocent public suffers for his ignorance."

A Plumber's Life: A fascinating glimpse of the life of a plumber of that era is portrayed in a family document donated to the archives of the United Association by **John Kremers** of Three Rivers, Michigan, and **Bob Matheson** of Rochester, Minnesota.

Both man are grandsons of **Ernest H. Maas, Sr.,** who lived around the turn of the century and founded Maas Plumbing and Heating Co., in Rochester. The company still exists under family ownership. Bob Matheson is its president.

Eight years old when he came to America, Ernest Maass, Sr., already had a full-time job in a tailor's shop when he was 12. Then he picked up work in a planing mill and later a saw mill at the princely daily wage of $1.50, all of which he dutifully turned over to his father.

"In those days, most of the children did not get the education they get nowadays. Work. Work. That was the idea and I always did work," wrote Ernest Maass, Sr., in a tone that betrays both lament and pride.

Work was more plentiful in Rochester than in his hometown of Winona, Minnesota, and he moved there in 1884 to work in a hardware store. "There were other reasons why I wanted to stay in Rochester," he confessed, "for I had made the acquaintance of some nice girls and so I made up my mind to stay." A three-year contract stipulated he would be paid $2 per week the first year, $3 the second, and a royal amount of $5 per week in the third year. "I had to pay $3 a week for board, so now figure that out," he wrote.

Maass moonlighted at making stovepipe at "one cent per piece," and earned another $1 a night for four extra hours of work. By dint of hard work, good reputation in stovepipe work, and a broken leg, he came to the attention of **Dr. W. W. Mayo,** and then Mayo's two sons, **Will** and **Charles,** the soon-to-be famous Mayo brothers, who established the Mayo Clinic.

The brothers tapped Maass to install the plumbing, tin work and cornices in the hospital building, all two floors and 15 rooms of it. The water closets emptied into a big cesspool until the public works system came on line a few years later.

There were two bathrooms, one on each floor of the clinic's original building. The bathroom had a common flat rim sink with two faucets, "which had to be operated by hand," Maass noted.

"Dr. Will wanted to know whether there was not some way by which he could operate the faucets with his feet," said Maass of the famous surgeon. A good workman must be innovative and willing to try new methods, so, "We had a pair of pedals made by a blacksmith, put some self-closing stops in the pipes under the sink and attached them to the pedals.

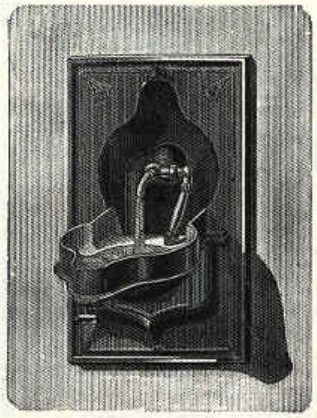
"Oh, Boy, that was something," he reminisced. "Just a wood floor in the operating room and yet that was the start." Expert lead-worker that he was, Maass also made lead screens for the new X-ray equipment.

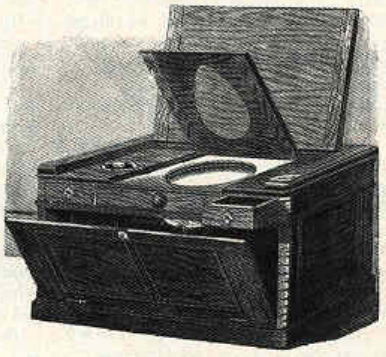
From workman to entrepreneur, Maass stabbed at opportunity again. With a partner, he took over a plumbing and steamfitting shop in Rochester and really set to task. They rented a building at $17 a month, and bought a two-wheeled cart. A horse was added, then two horses and a wagon. They incorporated in 1910 as Maas Plumbing and Heating Company.

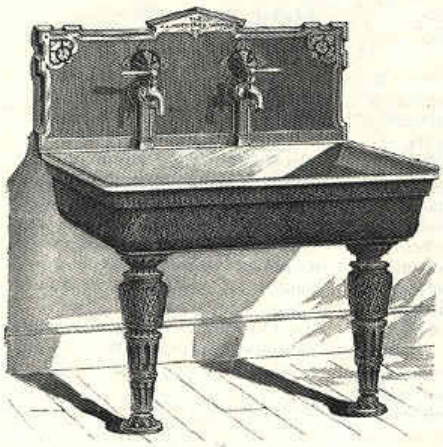
Product Explosion: There is a *joie de vivre* to the writings of Ernest Maass,

Below: Shown open, a folding lipped urinal, with silver plated faucet and couplings. It cost $21.

Bottom: The Plumbers Catalogue offered a water closet encased either in mahogany ($50), black or french walnut ($40) or plain black walnut ($30).







This complete cast iron kitchen sink was offered in sizes from 30" to 48" x 23" x 9", and cost from $16.50 - $24 (plain) to $33-$48 (enameled).

Sr., that reveal him to have been a delightful man and a credit to his trade. He clearly was proud at having been a plumbing innovator.

Others were not so happy with change. New technology and lack of uniform standards and requirements bedazzled many workers. The scope and range of new plumbing products could be intimidating.

Average citizens also had to adjust to changing habits and mores. Augmented by the rapid advances in plumbing technology and the low cost of goods produced on a mass scale, Americans were soon registering the highest standards in health and hygiene. But old ways are sometimes slow and unyielding to change.

Plated pipes of shiny brass tubing became the vogue, open plumbing quite the fashion. It was a sign of prosperity to show off the myriad loops and bends of plumbing scheme. Gone were the cabinet closets and dry-sink furniture. Freestanding fixtures became popular, and sometimes highly ornamented. Associated with sanitation and cleanliness, white became the chosen color.

As American manufacturers caught up with the Europeans, their plumbing products began to swamp the market. Indoor plumbing became a commonplace commodity, especially in the northeastern and Middle Atlantic states, which were close to the emerging American manufacturers and plumbing supply houses.

Horn Aplenty: The hand pump all but disappeared as faucets joined forces with the stalwart sink. Separate faucets for hot and cold appeared, usually of nickel-plated iron. For the more affluent were brass or copper faucets, the richest in gold- or silver-plating. To avoid confusion in running the water, the words "HOT" and "COLD" were written on the handles or maybe set on porcelain buttons at the top of the faucet.

At first, the spouts were fixed in place, but by the turn of the century, they swung around to right or left angles. Early models featured the high, gooseneck spouts which have become so popular again.

The pedestal-base sink became the sure-footed fixture in the bathroom. An ingenious touch was the soap receptacle and/or towel bars incorporated into the design.

Off the assembly line came sinks in all types of materials. Kitchen sinks were made from enamel, metal and soapstone, although soapstone became discolored and greasy-looking. Painted, galvanized or enamel cast-iron were the most common. But they weren't too durable—the coating wore off. Porcelain china, earthenware bowls and marble appeared in the bathroom then, soon to be replaced by vitreous china.

When they first came out, sinks were freestanding. They rested on cast-iron legs often painted white to match the enamel or porcelain. The legs imitated the period furniture, with ball or claw feet.

In the 1840s, the bathtub was widely denounced as an "epicurean English innovation which would surely corrupt the democratic simplicity of the Republic." By the 1890s, the Saturday night bath was an American tradition.

Prior to the 1890s, bathtubs were copper-lined wooden boxes, the metal requiring constant polishing. Then cast-iron tubs took hold, first appearing in institutions. They weren't too popular in private homes, however—the enameled linings tended to scale off. Porcelain was the choice material.

No Bums Allowed: A symbol of the finest and best plumbing lay in construction of George Washington Vanderbilt's Biltmore House in Asheville, North Carolina. "Bum" contractors need not apply, the work order stated.

Built in 1895, it featured 57 bathrooms, hot water, flush toilets, tubs and showers, the whole works. It's estimated that the estate cost the equivalent of well over $30 million in today's dollars to construct.

Vanderbilt ordered most of the fixtures and fittings from England—their plumbing products still being rated the best in style and quality. The closets featured copper-lined oak tanks. They were mounted approximately 8-10' above the bowl, operated by a swift tug of a pull-chain. The closets were all vented to the roof, and all water lines had drains.

Vanderbilt's personal bathroom featured a huge, round tub. Not lacking for any amenities, it also contained a hand-held shower.

Vanderbilt had no qualms about using American-made pipe; the quality was always first-rate. Unfortunately, there was no standardization—each pipe and fixture manufacturer had his own specifications. Neither in American nor metric measure was there any uniformity, not even in sink and basin outlets, faucet drilling, trap gauges, and so on.

To repair any brass pipe thread or valve tapping, for example, the fitter had to match exactly the thread size by using hand-operated dies. It must have taken a hunk of muscle and precision to cut 6' or 8" pipe!

Attitudes Die Hard: The Vanderbilt mansion offers an intriguing side trip through the history of American plumbing, but one that is very much off the beaten path.

The big story, and true glory, of the American plumbing industry, is its having brought sanitation and hygiene to the masses. It wasn't until after World War II that the majority of the American people had private baths in their homes. But long before private bathrooms became common, the working class had access to cleanliness in the form of public bath houses.

Chicago's first free public bath house opened with great fanfare in January 1894. Free soap and a towel were handed out to each bather, who was allowed 20 minutes. It was a great success. Like Roman spas of old, the bath house had a steam room and a pool. Brick ovens heated the room to 250', the customers lathering each other up with soapy warm water, using thick brushes of dried oak leaves. Patrons then doused themselves with cold water, took a shower and received a rubdown from the masseur.

But not everyone was happy. When another bathhouse was being built a couple of miles away, neighborhood citizens erupted in a near-riot. They allowed construction to proceed only after being assured that the presence of the bath house in their midst didn't mean they would be forced to take baths! **PM**

PLAGUES & EPIDEMICS

FROM PLUMBING AND MECHANICAL, JULY 1988

The first epidemic of a waterborne disease probably was caused by an infected caveman relieving himself in waters upstream of his neighbors.

Perhaps the entire clan was decimated, or maybe the panicky survivors packed up their gourds and fled from the "evil spirits" inhabiting their camp to some other place.

As long as people lived in small groups, isolated from each other, such incidents were sporadic. But as civilization progressed, people began clustering into cities. They shared communal water, handled unwashed food, stepped in excrement from casual discharge or spread as manure, used urine for dyes, bleaches, and even as an antiseptic.

As cities became crowded, they also became the nesting places of waterborne, insect-borne, and skin-to-skin infectious diseases that spurted out unchecked and seemingly at will. Typhus was most common, reported **Thomas Sydenham,** England's first great physician, who lived in the 17th century and studied early history. Next came typhoid and relapsing fever, plague and other pestilential fever, smallpox and dysenteries—the latter a generic class of disease that includes what's known as dysentery, as well as cholera.

The ancients had no inkling as to the true cause of their misery. People believed divine retribution caused plagues and epidemics, or else bad air, or conjunction of the planets and stars, any and all of these things.

Ignorance Ain't Bliss! How else to explain healthy people suddenly falling dead within hours and soldiers struck down with no signs of wounds? What else would cause such excruciating deaths, accompanied by delirium or hallucination, the body wracked by yellow or green or black vomit or excreta; or covered with obscene black boils, terrible red rashes or ghastly blue pallor? Why else would such sickness remain for months, then leave suddenly and not reappear till years later? Or perhaps it was replaced by a plague more deadly.

Hippocrates, the "Father of Medicine" who lived around 350 B.C., recommended boiling water to filter out impurities—those particles that pollute its sweet taste, mar its clarity or poison the palate.

He was onto something, but his advice pertained only to what the observer could taste, touch, smell or see with the naked eye. The "what you see is what you get" approach was about the extent of scientific water analysis until the late 1800s.

That *invisible* organisms also thrive and swim around in a watery environment was beyond imagination until a few centuries ago, and their connection with disease wasn't established till a scant 100 years ago. Although the microscope was invented in 1674, it took 200 years more for scientists to discover its use in isolating and identifying specific microbes of particular disease. Only then could public health campaigns and sanitary engineering join forces in eradicating ancient and

This 14th Century woodcut depicts the sorrow of medieval people as they begin burying their dead.

(Plumbing & Mechanical magazine, USA, June 1993, originally July 1988)

MISTAKING CAUSE FOR EFFECT.

Boy. "I SAY, TOMMY, I'M BLOW'D IF THERE ISN'T A MAN A TURNING ON THE CHOLERA."

Above: The fear that cholera can be maliciously "uncorked" in a street water hydrant

Top: No 19th Century home would be complete without a lavatory set for personal grooming and hygiene.

recurring enteric diseases, at least in developed countries of the world.

Cleaning Up: From archeology we learn that various ancient civilizations began to develop rudimentary plumbing. Evidence has turned up of a primitive flushing water closet used by the fabled King Minos of Crete back around 1700 B.C. The Sea Kings of Crete were renowned for their extravagant bath rooms, running hot and cold water systems, and fountains constructed with fabulous jewels and workings of gold and silver.

Just a few months ago, a colorful public latrine dating to the 4th century B.C. was unearthed on the Aegean island of Amorgos. The 7' x 5' structure resembles a little Greek temple. Topped with a stone roof, the interior walls decorated in red, yellow and green plaster, it served a gymnasium a short distance away. The building accommodated four people seated on two marble benches. Running water flushed the wastes away, probably along an open ditch at the users' feet.

Ancient water supply and sewerage systems—along with various kinds of luxury plumbing for the nobility—also have been discovered in early centers of civilization such as Carthage, Athens and Jerusalem as well. But it was the Roman Empire of biblical times that reigns supreme, by historical standards, in cleanliness, sanitation and water supply.

The Romans built huge aqueducts conveying millions of gallons of water daily, magnificent public baths and remarkable sewer systems—one of which, the Cloaca Maxima, is still in use. Rome spread its plumbing technology throughout many of its far-flung territories as well.

Yet, while we may rightfully marvel at the Roman legacy in plumbing, it should be noted that they were motivated primarily by concerns of esthetics, comfort and convenience. They understood very well that bringing fresh water to the masses and disposing of waste made for a more pleasant way of life, but there is little evidence they understood the connection with disease control.

Bursting Rome's Bubble: In fact, the magnificence of the great city-state diminishes quite a bit when its plumbing systems come under closer scrutiny.

Rome sprang up in haphazard fashion, a town of crooked, narrow streets and squalid houses. In its heyday, Rome had a population of over one million, and waste disposal was a definite problem.

The water supply of Rome was obtained from ground water and rain water, and in many cases these mixed together. The lowlands of the countryside were swampy marshes which developed into malarial wastelands. The Romans developed underground channels to drain the natural swamps and secure water for irrigation and drinking. Nonetheless, a particular region known as the Pontine Marshes were all but uninhabitable during the summertime, until drained during the regime of Benito Mussolini. (Some 40,000 Italians died in a 16th century malaria epidemic.)

A luxury toilet in the private houses of the well-to-do was a small, oblong hole in the floor, without a seat—similar to toilets that prevail in the Far East and other sections of the world even today. A vertical drain connected the toilet to a cesspool below.

The great Roman spas accommodated hundreds and even thousands of bathers at a time. But without filtration or circulation systems, the bathers basked in germ-ridden water and the huge pools had to be emptied and refilled daily.

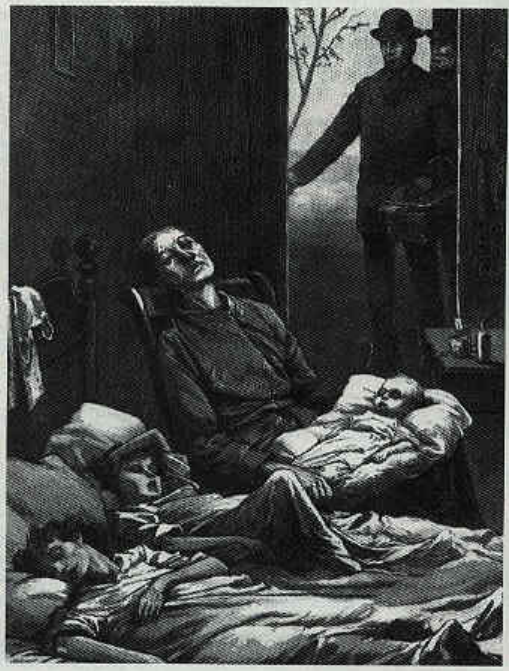
In public latrines, a communal bucket of salt water stood close by in which rested a long stick with a sponge tied to one end. The user would cleanse his person with the spongy end and return the stick to the water for the next one to use. The stick later evolved into the shape of a hockey stick, and the source for the expression "getting hold of the wrong end of the stick." It also provided an excellent medium for passing along bacteria and the assorted diseases they engendered.

Running water for the latrine either was supplied by stone water tanks or else by an aqueduct patterned after the graceful,

Above: The casual supply of water in barrels and buckets was easy prey to a waterborne bacteria.

Right: The agony of entire families beseiged with a dreaded disease, and the benevolence of some neighbors in aid.

Far right: Riots frequently broke out as friends and relatives rallied against the forced isolation of new arrivals by ship or steamboat.



curved arches made famous by the Roman engineers. Those water experts knew that covering water keeps it cool from the sun and helps prevent the spread of algae.

Imperfect though their plumbing knowledge may have been, the Roman Empire still did an admirable job assuring public cleanliness and, inadvertently, health. Rome employed administrators known as *aediles* to oversee various public works, including coliseum games and the police. They also were in charge of seeing that streets got swept of garbage and streams cleared of visible pollution and debris.

Decline & Fall: Though the Roman Empire would last until the 6th century A.D., its fall was preceded by centuries of gradual decay, conflict and unrest.

Ironically, some historians suggest that the Roman *plumberi* (plumbers) may have played a significant role in the downfall due to their extensive use of lead.

So prized was the craftsmanship of these *plumberi* that in lieu of present-day status symbols like a Rolls Royce

or Porsche, our Roman ancestors boasted of lead pipes in their houses, especially those imprinted with the plumber's name (usually female, by the way), and that of the building owner.

Lead poisoning is at least a plausible explanation for the dementia of Roman emperors such as Caligula and Nero, and for a general weakening and demoralization of the populace at large. However, the case for massive lead poisoning is far from proven, and water piping was hardly the only source of lead contamination. The widespread use of lead cooking utensils and drinking goblets probably was more harmful than its use in plumbing.

Whatever the causes, over time there was a noticeable deterioration in the moral values, dignity and physical character of Roman society. Symbolic of this general decline, by the time of Augustus Caesar in 14 A.D., the once-authoritative *aediles* collected the waste only at state-sponsored events.

During the final century of Roman domination, there was a succession of earthquakes, volcanic eruptions and disease epidemics. Soon afterwards, rampaging Vandals and other barbaric tribes completed the breakdown of Western civilization, as they systematically leveled and defiled the great Roman cities and their water systems.

Then came a thousand years of medieval squalor. A thousand years of sicknesses and plague of unbridled virulence, fanned by fleas and mosquitoes, excrement and filth, stagnant and contaminated water of every description.

Age Of Disease: The typical peasant family of the aptly-named Dark Ages lived in a one-room, dirt-floor hovel, with a hole in the thatched roof to let out the smoke of the central fire. The floor was strewn with hay or rushes, easy havens for lice and vermin. Garbage accumulated within. If they were lucky, the family had a chamber pot, though more likely they relieved themselves in the corner of the hovel or in the mire and muck outside.

Water was too precious to use for anything except drinking and cooking, so people rarely bathed. Heck, they barely changed clothes from one season to another, wearing the same set every day, perhaps piling on more rags for warmth.

These are the conditions which spawned the infamous Black Plague, killing an estimated one third of the European population. Although not directly related to bad plumbing, the plague serves as the most striking example of misery caused by poor sanitation in general, and the ignorance of people in controlling the outbreak.

The first of several waves hit England in 1348, caused by flea bites spread by insects that dwelled on host black rats. They, in turn, fed on the garbage and excrement of the masses. London became largely deserted. The King and Queen and other rich people fled to the countryside. The poor were the greatest sufferers.

Panic, death and despair followed the abandonment of farms and towns. Wrote William of Dene, a monk of Rochester in Kent, England, "Men and women carried their own children on their shoulders to the church and threw them into a common pit. From these pits such an appalling stench was given off that scarcely anyone dared to walk beside the cemeteries, so marked a deficiency of labors and workmen that more than a third of the land in the whole realm was left to."

So bad was the "Black Death," the Great Fire of London in 1666 can be viewed as a blessing in disguise. Though it killed thousands of people, the holocaust also consumed garbage, muck and black rats, effectively ending the plague.

Camp Killers: Bad plumbing was merely one of many sanitation factors that gave rise to the Black Death. Other scourges are more directly related to human waste. Dysentery is one that has left an indelible mark on history.

Characterized by painful diarrhea, dysentery is often called an army's "fifth column." Identified as far back as the time of Hippocrates and before, it comes in various forms of infectious disorders and is said to have contributed to the defeat of the Crusaders. Wrote the eminent English historian, **Charles Creighton:** "The Crusaders of the 11th-13th centuries were not defeated so much by the scimitars of the Saracens as by the hostile bacteria of dysentery and other epidemics."

The summer of the first Crusade in 1099 was extraordinarily hot as the ill-prepared and rag-tag "army" of men and camp followers went to war with little more than the clothes on their backs—confident that the Lord would provide for their needs in such a holy cause. They denuded the land of trees and bushes in the quest for nourishment. Hampered by lack of fresh water and contaminated containers, they trudged along to their destiny, relieving themselves along the wayside or in the fields.

Dysentery hit the women and children first, and then the troops. More than 100,000 died, plus almost 2,500 German reinforcements whose bodies remained unburied.

Typhus fever is another disease born of bad sanitation. It has come under many headings, including "jail fever" or "ship fever," because it is so common among men in pent-up, putrid surroundings. Transmitted by lice that dwell in human feces, the disease is highly contagious.

Napoleon lost thousands of his men to typhus in Russia—as did the Russians who caught it from the enemy. Many historians believe that Napoleon would have won were it not for the might of his opponents "General Winter, General Famine and General Typhus."

French ships were notorious for their filthy and fever-ridden sailors. One such French squadron left its soiled clothing and blankets behind near Halifax, Nova Scotia, when they returned to Europe in 1746, thinking they could dispel their own plague. Their infected blankets wiped out a nation of Indians.

Typhoid fever, a slightly different

ailment than typhus, involves a Salmonella bacillus that is found in the feces and urine of man. The symptoms are so similar to typhus that the two were not differentiated until 1837.

Prince Albert died from typhoid in 1861. His wife, Queen Victoria, had built-in immunity because of a previous siege. Good thing, because she is said to have prostrated herself in grief across the dead body of her beloved husband.

Ten years later, Victoria's son, Edward, almost died from the disease. A plumber traced the contamination to the lines of a newly-installed water closet and fixed the problem. Edward, the Prince of Wales, was very grateful to the plumber. Word spread of this episode and is thought to have hastened the acceptance of the indoor water closet in England.

By the time of the Boer War in 1899-1901, anti-typhoid inoculation was available. By then, typhoid fever was recognized as a waterborne disease, and that the germ could be killed by filtering and boiling water. Far from home in South Africa, the undisciplined British troops succumbed to the hot climate and drank straight from the rivers. Of 400,000 troops, 43,000 contracted typhoid.

Closer to home, typhoid raged on in colonial New York and Massachusetts. It reappeared for the last time in epidemic form in America in the early 1900s, compliments of the celebrated Typhoid Mary.

Mary Mallon was a cook for the moneyed set of New York State; her specialty was homemade ice cream. Officially, she infected 53 people—with three deaths—before she was tracked down. Unofficially, she is blamed for some 1,400 cases that occurred in 1903 in Ithaca, where she worked for several families. Never sick herself, it took a lot of persuasion by authorities to convince her that she was a carrier of the disease. Health authorities quarantined her once, let her go, then quarantined her for the rest of her life when another outbreak occurred.

The Cholera Story: The bad news is that another waterborne disease, cholera, has proven one of history's most virulent killers. The good news is that it was through cholera epidemics that epidemiologists finally discovered the link between sanitation and public health, which provided the impetus for modern water and sewage systems.

With 20th-century smugness, we know cholera is caused by ingesting water, food or any other material contaminated by the feces of a cholera victim. Casual contact with a contaminated chamberpot, soiled clothing or bedding, etc., might be all that's required.

The disease is stunning in its rapidity. The onset of extreme diarrhea, sharp muscular cramps, vomiting and fever, and then death—all can transpire within 12-48 hours.

In the 19th century cholera became the world's first truly global disease in a series of epidemics that proved to be a watershed for the history of plumbing. Festering along the Ganges River in India for centuries, the disease broke out in Calcutta in 1817 with grand-scale results.

India's traditional, great Kumbh festival at Hardwar in the Upper Ganges triggered the outbreak. The festival lasts three months, drawing pilgrims from all over the country. Those from

the Lower Bengal brought the disease with them as they shared the polluted water of the Ganges and the open, crowded camps on its banks. When the festival was over, they carried cholera back to their homes in other parts of India.

There is no reliable evidence of how many Indians perished during that epidemic, but the British army counted 10,000 fatalities among its imperial troops. Based on those numbers, it's almost certain that at least hundreds of thousands of natives must have fallen victim across that vast land.

When the festival ended, cholera raged along the trade routes to Iran, Baku and Astrakhan and up the Volga into Russia, where merchants gathered for the great autumn fair in Nijni-Novgorod. When the merchants went back to their homes in inner Russia and Europe, the disease went along with them.

Cholera sailed from port to port, the germ making headway in contaminated kegs of water or in the excrement of infected victims, and transmitted by travelers. The world was getting smaller thanks to steam-powered trains and ships, but living conditions were slow to improve. By 1827 cholera had become the most feared disease of the century.

The Laughter Died: It struck so suddenly a man could be in good health at daybreak and be buried at nightfall. A New Yorker in 1832 described himself pitching forward in the street "as if knocked down with an axe. I had no premonition at all."

The ailment seemed capable of penetrating any quarantine of harbor or city. It chose its victims erratically, with terrifying suddenness, and with gross and grotesque results.

Acute dehydration turns victims into wizened caricatures of their former selves. The skin becomes black and blue, the hands and feet drawn and puckered. The German poet Heinrich Heine described an outbreak in Paris in a letter to a friend:

"A masked ball in progress...suddenly the gayest of the harlequins collapsed, cold in the limbs, and underneath his mask, violet blue in the face. Laughter died out, dancing ceased and in a short while carriage-loads of people hurried from the dance to the Hotel Dieu to die, and to prevent a panic among the patients were thrust into rude graves in their dominoes [long, hooded capes worn with a half-mask]. Soon the public halls were filled with dead bodies, sewed in sacks for want of coffins...Long lines of hearses stood in queue..."

The worldwide cholera epidemic was aided by the Industrial Revolution and the accompanying growth of urban tenements and slums. There was little or no provision at all for cesspools or fresh water supplies. Tenements rose several stories high, but cesspools were only on the ground floor with no clear access to sewers or indoor running water. It didn't make much difference, because until the 1840s a sewer was simply an elongated cesspool with an overflow at one end. "Night men" had to climb into the morass and shovel the filth and mire out by hand. In most cases, barrels filled with excrement were discharged outside, or contents of chamber pots flung from open windows—if there were any—to the streets below.

Water hydrants or street pumps provided the only source of water, but they opened infrequently and not always as scheduled. They ran only a few minutes a day in some of the poor districts. A near riot ensued in Westminster one Sunday when a water pipe that supplied 16 packed houses was turned on for only five minutes that week.

Cholera first hit England through the town of Sunderland, on October 26, 1831. One William Sproat died that day from the disease, though nobody wanted to admit it. Merchants and officials found plenty of reasons to rationalize away a prospective 40-day maritime quarantine of the ports.

England was reaping the profits of the Industrial Revolution, and a quarantine of ships would be catastrophic for the textile industry. At any rate, the medical profession held that cholera wasn't contagious. Public health administration was in its infancy, and so disorganized that the leading doctor didn't know there were two infected houses only a short distance away from each other. He learned of the "coincidence" three months later.

The American Experience: American hygiene and sanitation were not much better. Cholera spread through immigrants from the infected countries, Ireland in particular, whose masses were fleeing the poverty and despair of the potato famine. Those who could scrape together three pounds for passage left for North America.

Life aboard an immigrant ship was appalling as ship owners crowded 500 passengers in space intended for 150. Infected passengers shared slop buckets and rancid water.

The contagion spread as soon as the immigrants landed. In one month, 1,220 new arrivals were dead in Montreal. Another 2,200 died in Quebec over the summer of 1832.

Detroit became another focal point of cholera. Instead of drawing fresh water from the Detroit River, people used well water. The land was low and it was much more convenient. But outhouses placed at odd locations soon contaminated those wells, and cholera spread quickly.

Cholera entered New York through infected ships. City people started clogging the roads in an exit to the countryside. On June 29, 1832, the governor ordered a day of fasting and prayers—the traditional response by government to treating the disease. After July 4, there was a daily cholera report.

Quarantine regulations which sought to contain towns and

cities in upper New York, Vermont and along the Erie Canal met with little success. Immigrants leaped from halted canal boats and passed through locks on foot, despite the efforts by contingents of armed militia to stop them.

Some doctors flatly declared that cholera was indeed epidemic in New York, but more people sided with banker John Pintard that this "officious report" was an "impertinent interference" with the Board of Health. The banker incredulously asked if the physicians had any idea what such an announcement would do to the city's business.

Visitors were struck by the silence of New York's streets, with their unaccustomed cleanliness and strewn with chloride of lime (the usual remedy for foul-smelling garbage). Even on Broadway, passers-by were so few that a man on horseback was a curiosity. One young woman recalled seeing tufts of grass growing in the little-used thoroughfares.

Big news was unfolding in England then, but no one realized the significance.

Steadfast Ignorance: The eminent **Dr. John Snow** demonstrated how cases of cholera that broke out in a district of central London could all be traced to a single source of contaminated drinking water. Sixteen years later Snow would win a 30,000 franc prize by the Institute of France for his theory that cholera was waterborne and taken into the system by mouth.

But Snow's original work received little attention from the medical profession. He was attacked at the weakest point—that he could not identify the nature of the "poison" in the water.

By the end of the first cholera epidemic, the relationship between disease and dirty, ill-drained parts of town was rather well established. This should have spurred sanitary reform. But little action followed.

An out-of-sight, out-of-mind syndrome developed when the first epidemic ended. The learned *Edinburgh Medical and Surgical Journal* at one point declared they would review no more books on the subject "because of the multitude of books which have recently issued from the press on the subject of cholera, and our determination to no longer try the patience of our readers."

When the second cholera epidemic hit England in 1854, Snow described it as "the most terrible outbreak of cholera which ever occurred in this kingdom." At least it provided him with an opportunity to test his theory.

By charting the incidence of the disease, he showed that over 500 cases occurred within 10 days over a radius of some 250 yards centered on London's Broad Street. He looked for some poison which he believed came from the excreta of cholera patients and swallowed by the new victims. A common factor was their use of water that had been polluted with sewage. Snow had traced the pipelines of various water companies and showed that one was infected by cholera.

By the methodical process of elimination, he proved his point: A workhouse in that area had its own private well, and there were only 5 deaths among its 535 inmates. A brewery on Broad Street likewise never used the water from the Broad Street pump, and it had no cases among its 70 workers.

The actual discovery of the comma-shaped bacillus of cholera was made by the German **Dr. Robert Koch** in 1876. Through microscopic examination, he ascertained that "excrement may contain cholera bacteria a good while after the actual attack of the disease."

Final Obstacles: Cholera was always the worst where poor drainage and human contact came together. This of course was apt to be in crowded slums.

So at first, those on top of the social heap could reassure themselves that pestilence attacked only the filthy, the hungry and the ignorant. When the cholera epidemic first hit Paris, there were so few deaths outside of the lower classes, that the poor regarded the cholera epidemic as a poison plot hatched by the aristocracy and executed by the doctors. In Milwaukee, efforts to apply basic health measures were thwarted by rag-pickers and "swill children" who saw the removal of offal and garbage from the streets as a threat to their livelihood. As one newspaper editorialized, "It is a great pity if our stomachs must suffer to save the noses of the rich."

The immunity enjoyed by the wealthy was short-lived, however. The open sewers of the poor sections eventually leached into the ground and seeped into wells, or ran along channels into the rivers that supplied drinking water for whole towns and cities. Once the rich and the movers and shakers of society began to get sick, government reform began.

Thus it happened that most municipal water mains and sewer systems got built in the late 19th century in America. Public health agencies got formed and funded. Building codes and ordinances got passed and enforced.

The superstitions of the ages had finally run their course. Mankind began to understand that the evil spirits causing its woes were microscopic creatures that could be defeated by plumbers and sanitary engineers.

Plumbers finally got to show their stuff in a way that had not been seen since the days of the Roman Empire. **PM**

JOSEPH WALLER,

Chimney-Sweeper & Nightman,

Facing the Three Hats, next Door to the Swan,
Near the Turnpike, ISLINGTON;

BEGS Leave to acquaint the Public in Country, Town and City, that he cleans Chimneys in the neateſt Manner, as he goes with the Boys himſelf; alſo cleans Smoke-Jacks and Smokey-Coppers, having Boys of all Sizes from the ſmalleſt Flue to the largeſt; and when Chimneys are on Fire puts them out with the greateſt Care and Safety.

☞ He likewiſe keeps Carts and Horſes for emptying Bog-Houſes, Drains, and Ceſſpools, with the utmoſt Expedition, and by a ſtrict Attention to Buſineſs, performs what he undertakes with the utmoſt Care and Decency, on the moſt reaſonable Terms.

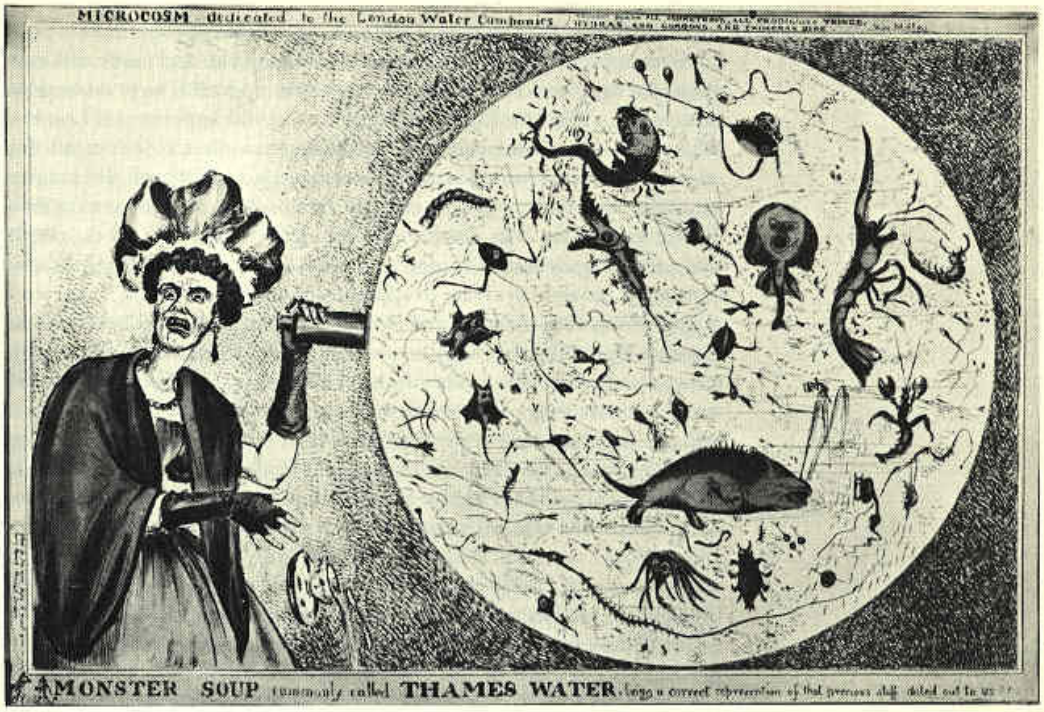
*** Thoſe who pleaſe to Favor him with their ORDERS, may depend on having them faithfully Executed, and the Favor gratefully acknowledged, *By their moſt obedient humble Servant,*

JOSEPH WALLER.

N. B. I ſhall eſteem it a Favor if you will be ſo kind as to let this Bill be ſtuck-up in ſome Part of the Kitchen to prevent Miſtakes.

Printed by T. PALSER, No. 11, Turnagain-Lane, Fleet-Market.

An 18th Century advertisement for "Emptying Bog Houses"
(London under London-A Subterranean Guide, Richard Trench & Ellis Hillman, John Murray 1984, page 62)

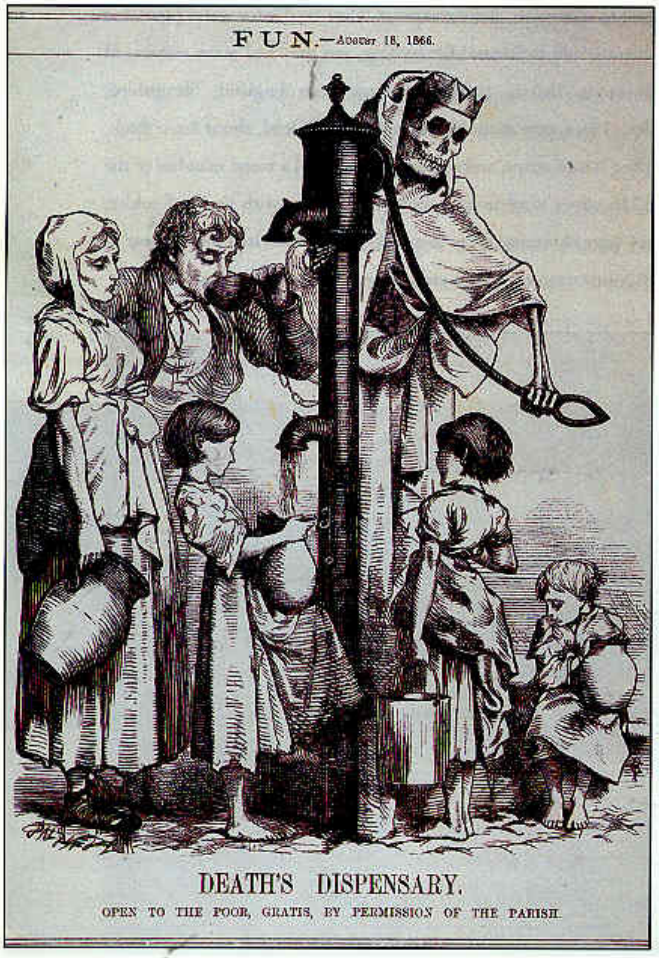


89

Early 19th century cartoons commenting on the dangerous state of the River Thames, a source of London's drinking water
(London under London, page 89)

EVEN in the first century BC, the dangers of lead poisoning, or plumbism, were already known to the Romans. Vitruvius, the engineer and author of the classic De architectura, wrote at this time that lead should not be used for water supply pipes, but his advice seems to have gone unhindered. Almost 2,000 years later, it was still in common use in Britain for this purpose, and it is estimated that today some nine million homes are still supplied through lead pipes. Between the fifth century AD, when the Roman Empire fell, and the nineteenth century, there were virtually no significant technical developments in the history of plumbing. What finally brought about the changes when they did come was the pollution of water supplies that grew worse as rapid industrialisation and urbanisation swept Britain and other European countries. Epidemics, caused by waterborne organisms, were frequent during the Middle Ages. Later, during the seventeenth and eighteenth centuries, new distribution systems were introduced in London and Paris mostly using cast iron pipes. It was not until the nineteenth century, though, that effective filtration methods were employed. At first this was by the slow-sand method; later still, by the use of chemicals to sterilise the water using chlorine compounds.

Public health measures sought to eradicate the widespread outbreaks of typhoid, cholera and other infections caused through primitive water supply and drainage systems. As they began to be effective, life expectancy rose dramatically. By the middle of the nineteenth century, Manchester had introduced the first municipal water supply. By 1865 London had spent £4 million on an 83-mile long sewerage system and other measures stemming from various health acts.



A social comment on the quality of public drinking water, from 'Fun' magazine, 1866

(Well Washed and Watered, Charles Knevitt, Institute of Plumbing, c.1997)

THOMAS CRAPPER: MYTH AND REALITY

HEATHER MCCUNE

The debate over who Thomas Crapper was — or even if there was a Thomas Crapper at all — continues. His contributions to the plumbing industry are even more suspect. But with this article we intend to replace myth with fact, for we have found a cadre of Thomas Crapper scholars who have made it their life's work to prove that Crapper is more than just a slang term brought home by the World War I doughboys.

For this article we interviewed **Dr. Andy Gibbons,** historian of the International Thomas Crapper Society, and **Ken Grabowski,** a researcher and author who is writing a book on Crapper's life.

Myth: Thomas Crapper as a person never existed.

Fact: Though we do not know his actual date of birth, we can now say the man Thomas Crapper probably was born in September 1836, since he was baptized the 28th of that month. Crapper did have a successful career in the plumbing industry in England from 1861 to 1904.

The date of Crapper's death has also been a source of confusion for many years. For example, Chase's Annual Events, the authoritative book for listing special days and dates, has listed January 17 as Thomas Crapper Day and January 17, 1910 as the date of his death.

After all his research, Gibbons was certain that Chase's was 10 days off. The actual date of Thomas Crapper's death was January 27, 1910. The error probably resulted from an honest typo in "Flushed With Pride," by Wallace Reyburn, says Gibbons, "but I waged a 10-year battle with Chase's to get them to change the date." He finally won his battle this year after supplying them with a photo of Thomas Crapper's tombstone, notes from a living descendent, and a copy of the man's official death certificate.

Myth: Thomas Crapper invented the toilet.

Fact: No one in the know about Thomas Crapper would ever make this statement. In his research, Grabowski has created a detailed history of Crapper's business life. The man holds nine patents, four for improvements to drains, three for water closets, one for manhole covers and the last for pipe joints. Every patent application for plumbing related products filed by Crapper made it through the process, and actual patents were granted.

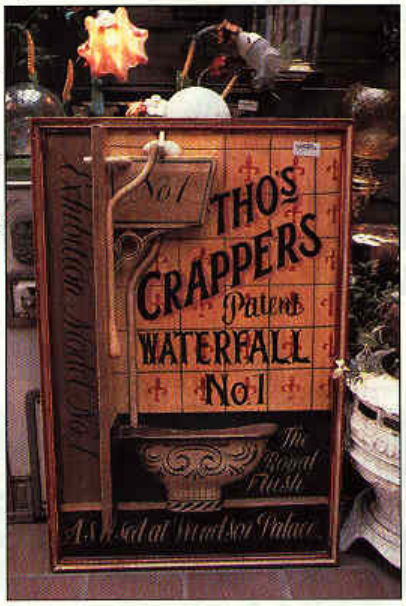
The most famous product attributed to Thomas Crapper wasn't invented by him at all. The "Silent Valveless Water Waste Preventer" (No. 814) was a syphonic discharge system that allowed a toilet to flush effectively when the cistern was only half full. British Patent 4990 for 1819 was issued to a **Mr. Albert Giblin** for this product.

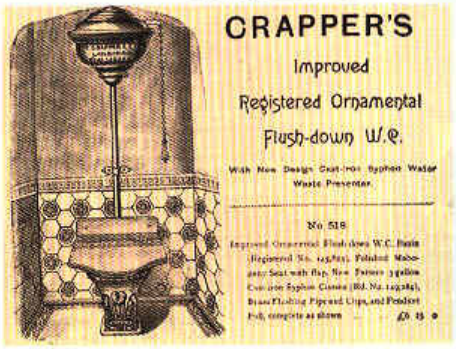
There are a couple of theories on how Thomas Crapper came to be associated with this device. First, is that Giblin worked for Crapper as an employee and authorized his use of the product. The second, and more likely scenario, says Grabowski, is that Crapper bought the patent rights from Giblin and marketed the device himself.

Myth: Thomas Crapper never was a plumber.

Fact: Oh yes he was. He operated two of the three Crapper plumbing shops in his lifetime, but left the business three years before the final and most famous facility on Kings Road in London. When Crapper retired from active business in 1904, he sold his shop to two partners who, with help from others, operated the company under the Crapper name until its closing in 1966.

BELOW: This sign is for sale at a lighting shop in London. The asking price of this gem was around $280.





LEFT: A Thomas Crapper advertisement picked up at a souvenir stand in Stoke-On-Trent, England.

RIGHT: Another example of Crapper memorabilia from a souvenir store.

(Plumbing & Mechanical magazine, June 1993)

[THOMAS CRAPPER]

Possible site of part of Thomas Crapper's works in the 600 block of Kings Road.

Several of London's current plumbing companies trace their trade roots to Thomas Crapper. One, **Mr. Geoffrey Pidgeon** of Original Bathrooms (Richmond upon Thames, Surrey, Great Britain), continues the trade of his great uncle and grandfather, both of whom apprenticed under Thomas Crapper.

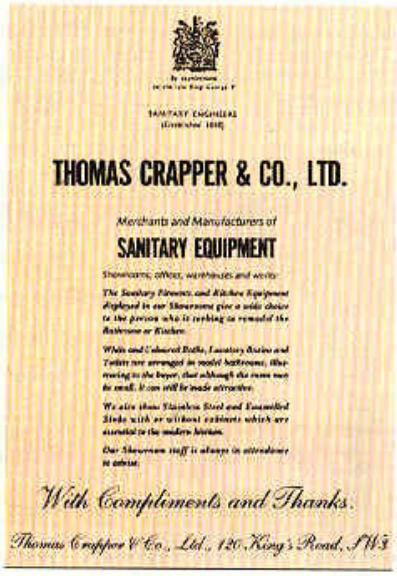
Thomas Crapper did serve as the royal sanitary engineer for many members of England's royalty, but contrary to popular myth, he was never knighted, and thus isn't entitled to use the term "Sir" before his name.

Myth: The word "crap" is derived from Thomas Crapper's name.

Fact: The origin of crap is still being debated. Possible sources include the Dutch Krappe; Low German krape, meaning a vile and inedible fish; Middle English crappe, and Thomas Crapper. Where crap is derived from Crapper, it is by a process know as, pardon the pun, a back formation.

The World War I doughboys passing through England brought together Crapper's name and the toilet. They saw the words T. Crapper — Chelsea printed on the tanks and coined the slang "crapper" meaning toilet.

The legend of Thomas Crapper takes its flavor from the real man's life. While Crapper may not be the inventor of the product he is most often associated with, his contribution to England's plumbing history is significant. And the man's legend, well, it lives on despite all proof to contrary. **PM**



SANITARY ENGINEERS

THOMAS CRAPPER & CO., LTD.

Merchants and Manufacturers of

SANITARY EQUIPMENT

Showrooms, offices, warehouses and works:

The Sanitary Fixtures and Kitchen Equipment displayed in our Showrooms give a wide choice to the person who is seeking to remodel the Bathroom or Kitchen.

White and Coloured Baths, Lavatory Basins and Toilets are arranged in model bathrooms, illustrating to the buyer, that although the room may be small, it can still be made attractive.

We also show Stainless Steel and Enamelled Sinks with or without cabinets which are essential in the modern kitchen.

Our Showroom staff is always in attendance to advise.

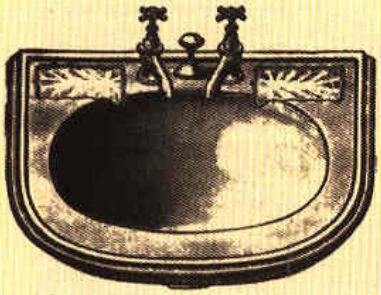
With Compliments and Thanks.

Thomas Crapper & Co., Ltd., 120 King's Road, S.W.3

Obviously fraudulent Crapper ad, complete with Crapper's royal "appointment." One should also note that stainless steel was not manufactured until the 20th century.

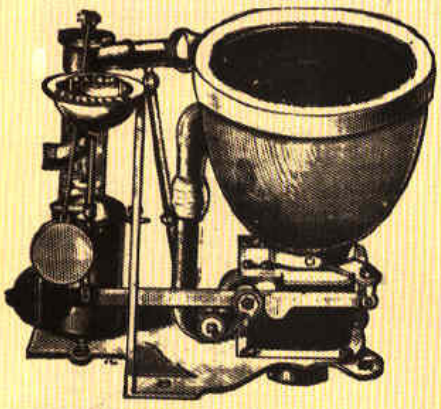
THOMAS CRAPPER & CO.'S

Sanitary Specialities,



IMPROVED
LAVATORY BASIN.

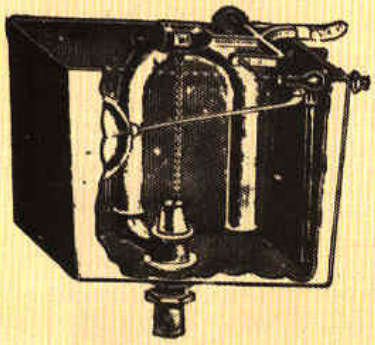
	£	s.	d.
White Ware, fitted with combined Overflow and Waste, and ½ Standard Screw-down Valves ...	2	19	6
Plated Fittings, Extra	0	8	6



ELASTIC VALVE CLOSET.

No. 78.—Valve Closet, with white china dish with gold lines, and handle, white ware flushing rim basin, 1 in. supply valve, copper air regulator, complete as shown.

		£	s.	d.
		£3	9	6
If with 1¼ in. valve	Extra	0	3	6
„ Ornamental Basin	„	0	3	6
„ White and Gold Basin	„	0	8	9
„ Box Enamelled inside	„	0	4	9
„ Box fitted with Brass Top ...	„	0	6	3
„ Box fitted with union to connect Ventilating Pipe	„	0	3	9
„ 4 in. outlet	„	0	7	9



IMPROVED SYPHON
Water Waste Preventer.

	£	s.	d.
Cast-Iron 2 Gallon Syphon Waste Preventer, with Tranquil Inlet Valve, and Silencing Air Tubes, and Brass Chain and China Pull	1	1	6
Ditto, 3 gallon ditto	1	3	6

50, 52, & 54, MARLBOROUGH ROAD, CHELSEA, LONDON, S.W.

THE HISTORY OF PLUMBING
PART THREE

THOMAS CRAPPER THROUGH A SCHOLAR'S EYES

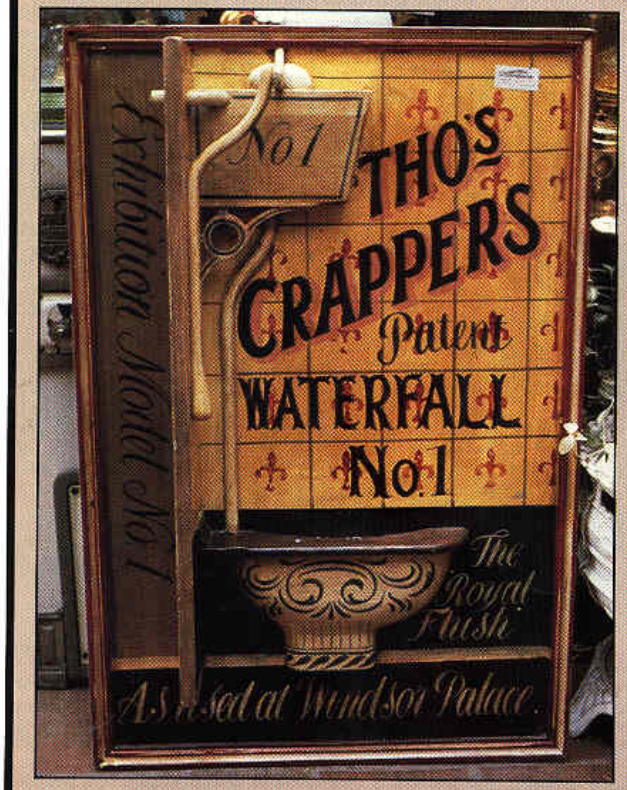
Which came first, the word "crap" or the name of the legendary inventer of the Valveless Water-Waste Preventer? Yes, for the third straight year PM reports another raging debate over the very existence of **Thomas Crapper.** He is forever (it seems) regaled in the annals of plumbing lore as a great sanitary engineer and master plumber of the royal water closets of England.

Into the heart of controversy has plunged **Dr. Robert H. Bell,** professor of English at Williams College. Appearing in the March-April edition of the learned *Harvard Review*, Bell's essay "In Quest of Crapper" seeks to divine the origins of the word, "crap." It first appeared in a *Supplement to the Oxford English Dictionary* as a synonym for "excrement, defecation."

Bell was a little bemused that Crapper would have been nine years old when the word "crap" officially came into recorded use in 1846 — that is, if one takes seriously the birth date given in Wallace Reyburn's 90-page tome, *Flushed With Pride: The Story of Thomas Crapper*, published in 1969.

Admittedly skeptical, Dr. Bell first thought Reyburn's book was an elaborate hoax. Then he picked up a *Newsweek* which reviewed the book. The magazine concluded that

By Carol Pomerantz



London "Crapabilia" includes the sign at left offered by a lighting shop for around $280, and a souvenir stand's version of a Thomas Crapper advertisement.

Reprinted from Plumbing & Mechanical, July 1988

(Plumbing & Mechanical magazine, July 1988)

the "man not only lived but made a lasting contribution to mankind's comfort."

His curiosity really piqued, Bell dug further. He checked encyclopedias but couldn't find a bit of Crapper in them. Nor did the *London Times* report his supposed death in 1910.

Yet he did find an entry in *The People's Almanac* under "The History of the Toilet." Crapper, he read, is "a myth created by Wallace Reyburn, and noted that many prestigious people and learning institutions have fallen for Reyburn's spoof as historical fact."

Digging yet deeper, Bell uncovered a *London Times* article dated Nov. 27, 1979 about the Greater London Council's desire to honor Crapper with a blue plaque to commemorate his former home. But "The Committee decided that 'memorable though Crapper's name might be in popular terms,' evidence from the Patents Office showed that he was not a notable inventor or pioneer in his field."

Bell was disturbed, and had discussions with esteemed colleagues about the merits of Crapper. He wrote to the Library of Congress and asked them to check the London post office directories of the 1890s. He listened carefully to the chairman of the history department firmly espousing his belief that of course there was an English Crapper — why the man's name was inscribed on a venerable Victorian Crapper in his friend's loo. (However, whether the toilet bore the inventor's name or simply referred to "a Crapper" as slang wasn't made clear.)

Bell next contacted an eminent scholar whose assistant pored over London's Registery of Deaths. Ah, no record there of the vaunted Crapper name — but at least 5% of names are not recorded, it was explained. And the reference in David Piper's *The Companion Guide to London* to Crapper's address? It comes with the explanation that one can find "Mr. Thomas Crapper's renowned establishment (sanitary engineer to King George V)" — but Crapper supposedly died the year young George became king.

Then the Library of Congress scored one for Crapper's side. It had tracked down *The Post Office London Directory for 1897*, which lists Crapper's address (on page 525) as "numbers 50, 52, and 54 Marlboro Road: Crapper, Thomas and Co., sanitary engineers." Plus it threw in corroboration of patent numbers for toilet devices, dated and in the name of Thomas Crapper.

What About Reyburn? Really excited now, Bell then delved into the credentials of Crapper's biographer, Wallace Reyburn. Bell couldn't find out too much about him other than he wrote for that "bastion of spoofery" *The New Yorker*. Next, he tried contacting Reyburn's editor, but the man was no longer around. "Some old hands" insisted at Prentice-Hall that "there really was a Crapper, although it was unclear if he had any claim to fame."

Alas, Bell was too swift in condemning Crapper — or so he thought — and turned his thoughts to more scholarly matters. But he had to stifle the impulse a year later while in London to head for "Elmer's End," the cemetery in which Crapper supposedly rests. "I couldn't remember the plot number of Crapper's grave," he wrote.

Then Bell recalled Reyburn's reference to Westminster Abbey and a drain marked "Thos. Crapper." He sped to the Abbey and found Freddie the Guide to show him around. (You may remember Freddie from last year's episode of the "Continuing Crapper Controversy." Evidently he was the same guide who directed Dr. **Hugo Boschmann** in his search for Crapper. PM printed Boschmann's photograph of the famous manhole cover supplied by T. Crapper & Co.) Eyeing that marker inscribed with Crapper's name indeed made himself a believer, "even moved," wrote Bell.

Yes, PM agrees, there probably was a Thos. Crapper. Put in perspective, though, he should best be remembered as a merchant of plumbing products, a terrific salesman and advertising genius.

Alexander Cummings invented the first flush mechanism in 1775. The float and valve system was developed by **Joseph Bramah** a few years later. And **Thomas Twyford** pioneered the first trapless toilet. These are proud names all but foreign to most people outside the plumbing industry. But the name of Thomas Crapper chuckles on and on.

Finally, Bell writes: "Yet I still have moments, sitting in the smallest room in my house, when I wonder, Did destiny or coincidence give the inventor a name that already meant excrement or defecation?"

The Crapper controversy continues.

— PM

Reprinted from Plumbing & Mechanical, July 1988

Thomas Crapper (1835–1910)

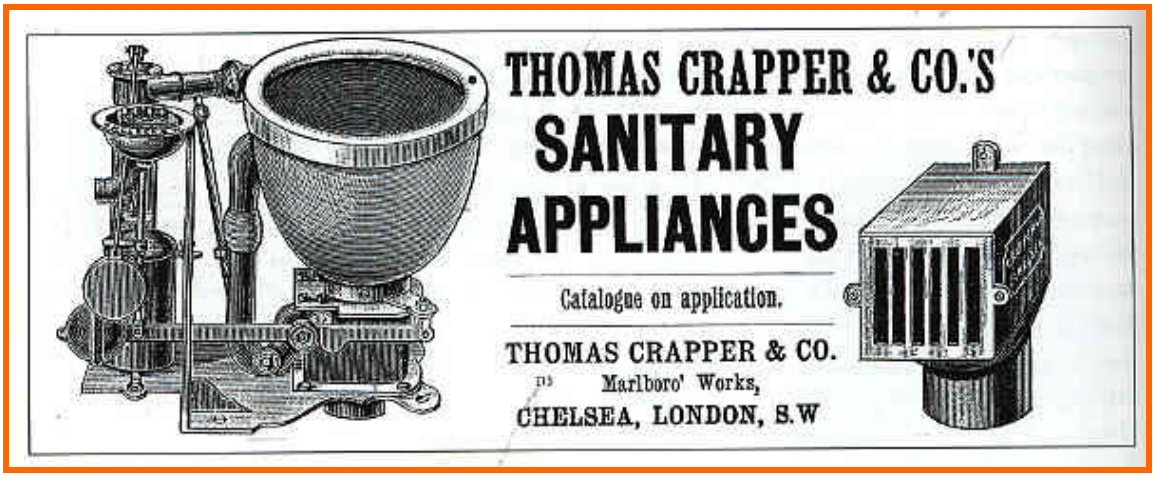
THOMAS CRAPPER was born in Thorne, near Doncaster, Yorkshire. As a young boy, he appears to have decided that his future lay in London, and aged only eleven walked to the capital where he found employment with a plumber in Chelsea. In 1861 he established his own business in Robert Street, and in 1866 moved to Marlborough Road where he established a manufactory including a brass works.

Thomas Crapper. (*Thomas Crapper and Co. Ltd*)

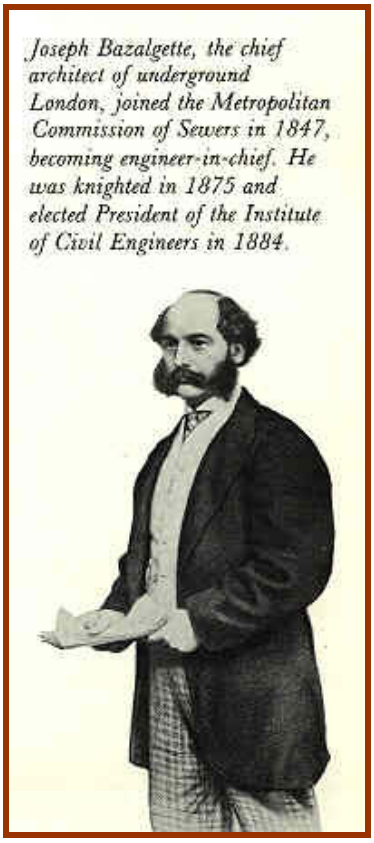
In spite of his fame, Crapper actually had very little to do with the development of the water closet. No major stages in its development are attributable to him, although he took out a patent for a self-rising closet seat in 1863 and another in 1902 for a trough closet fitted with water-sealed traps under each unit. His biographer, Wallace Reyburn, has emphasised his role in developing water waste preventing cisterns, but he was not responsible for any major improvements in these either. By the time he took out a patent for automatic flushing cisterns in 1891, 'pull and let go' syphonic cisterns were already well established. He also patented a disconnecting trap for drains, a seat-action automatic flush and, in 1903, an improved type of stair tread.

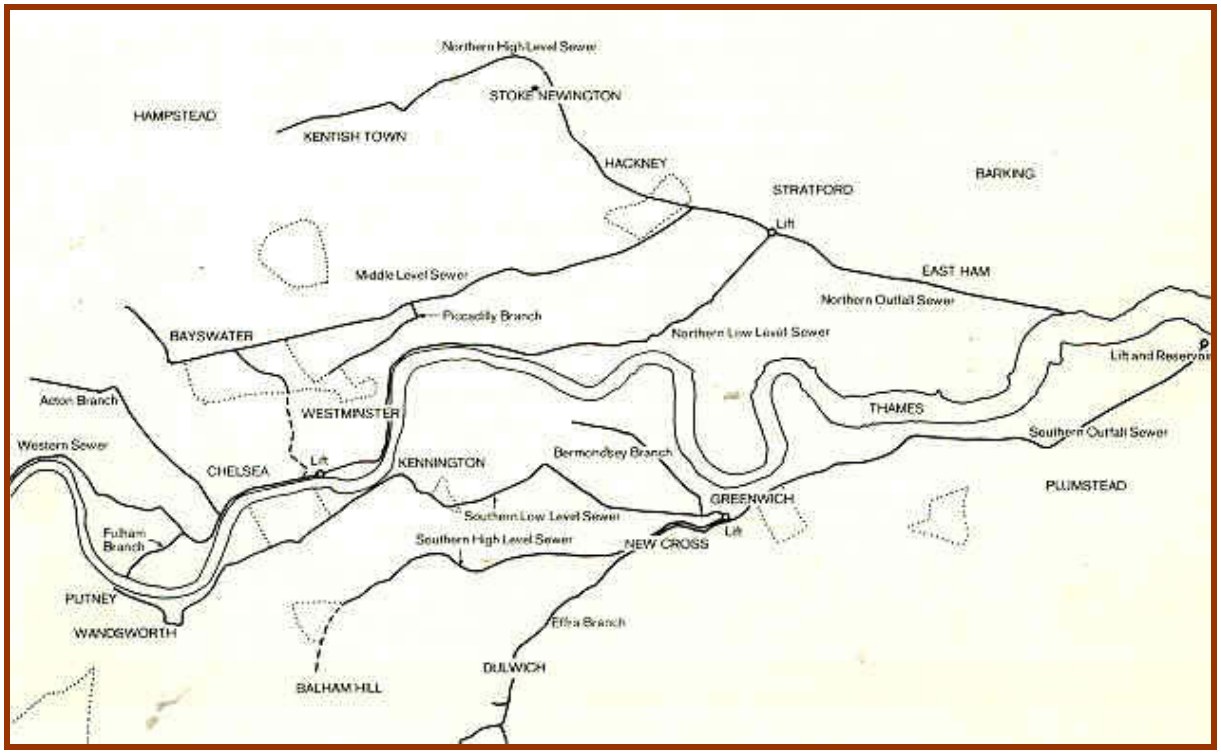
Thomas Crapper's place in the history of sanitary equipment, therefore, is not that of a pioneer, but rather as a representative of the many Victorian sanitaryware manufacturers who profited from efforts to improve standards of public health and domestic sanitation from the 1840s. Like many sanitary engineers, Crapper's technical skills were based in metal working – in his case, plumbing and brass founding – and not potting. Crapper produced a wide range of sanitary fittings including domestic ware – such as the attractive ceramic pedestal closet, the 'Marlboro', introduced in 1887 – and drain components. Cast-iron man-holes bearing his name are widely found: there are three in Westminster Abbey. In 1886 he was granted a royal warrant after installing new sanitary fittings at Sandringham House, the home of the Prince of Wales.

In 1907 the firm moved to 120 Kings Road, Chelsea and Thomas sold the business to his old partner, Robert Wareham and his nephew, George Crapper. He was remembered as a genial man of average height with a grey beard similar to that of George V. He died in 1910 and is buried in Elmers End Cemetery, south-east London. The firm continued to trade independently until 1966 when it was taken over by John Bolding and Co. who went bankrupt in 1969. Crapper and Co. was sold to another firm and lay dormant until acquired by Simon Kirby in 1999. Now back in business at Alscott Park, Stratford-on-Avon, Thomas Crapper and Co.'s range includes a water closet, the 'Venerable', cast-iron cisterns and lavatory basins based on items produced by the company in the late nineteenth century.

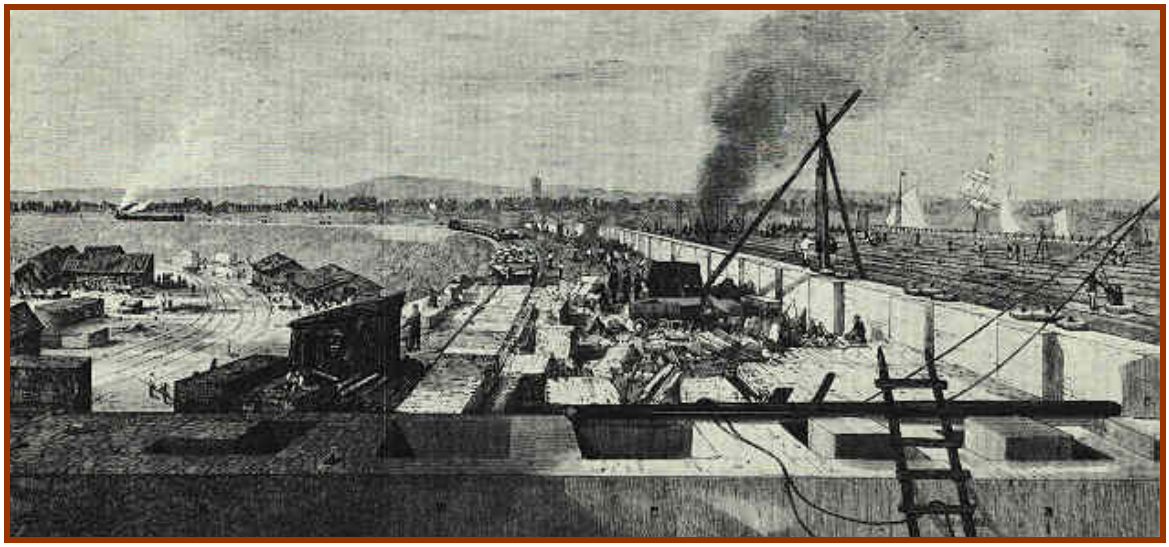


(Bogs, Baths & Basins: The Story of Domestic Sanitation, David J Eveleigh, Sutton Publishing, 2002)



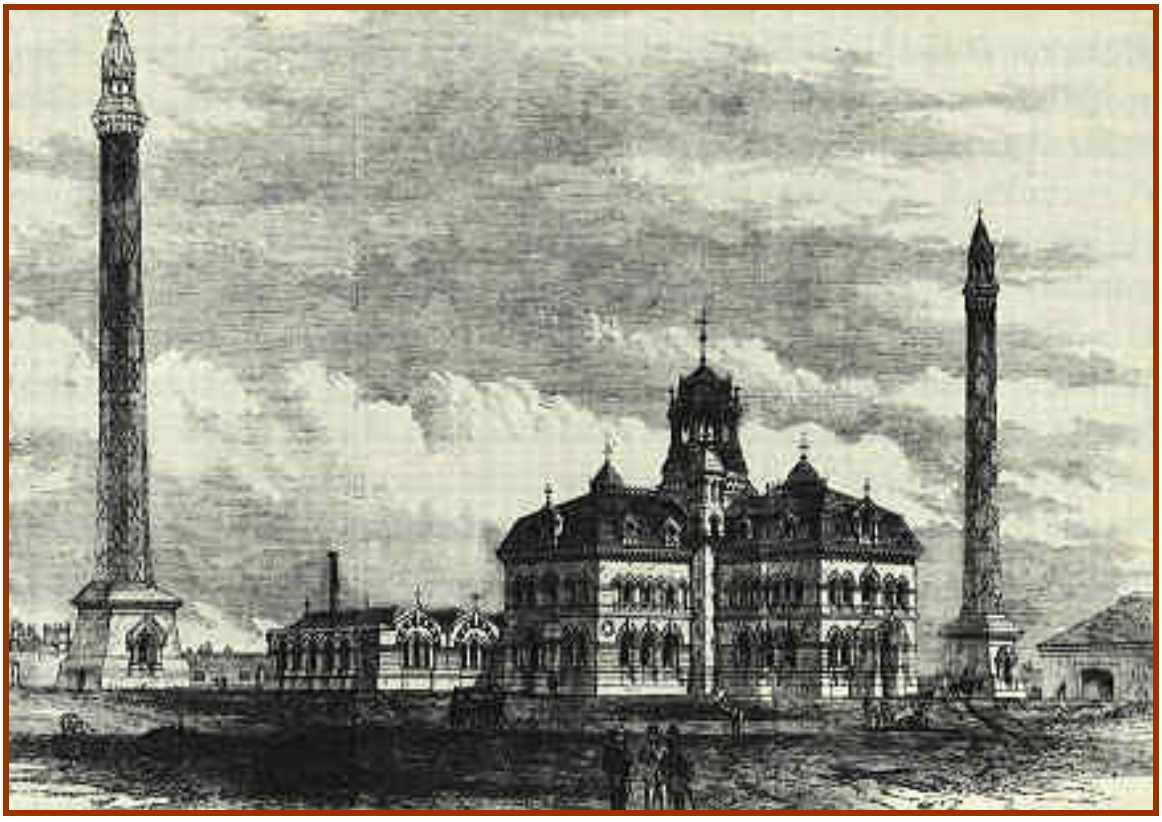


Bazalgette's map of London's main interceptory sewer system, started 1859, finished 1865
(London under London-A Subterranean Guide, Richard Trench & Ellis Hillman, John Murray 1984, page 72)

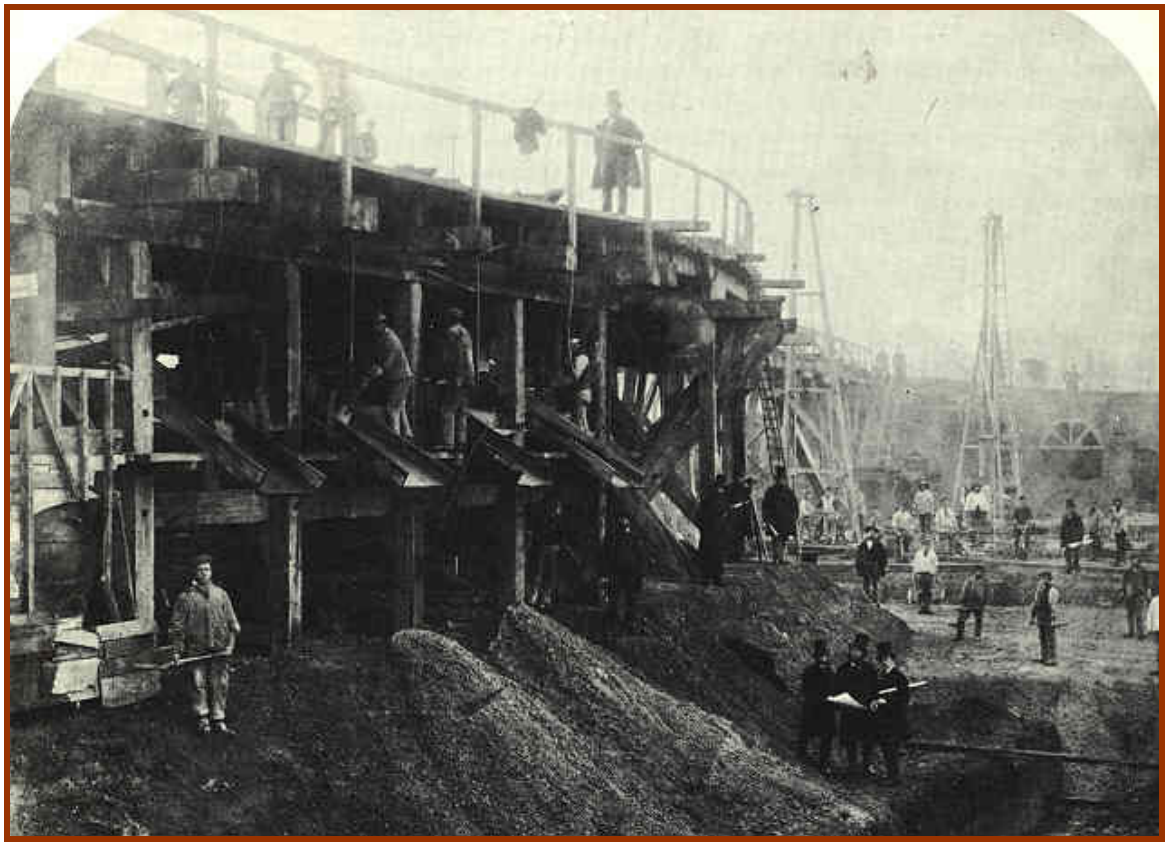


Work on the northern outfall sewer running across Plaistow and East Ham Marshes to Beckton, started 1861 (London page 74)

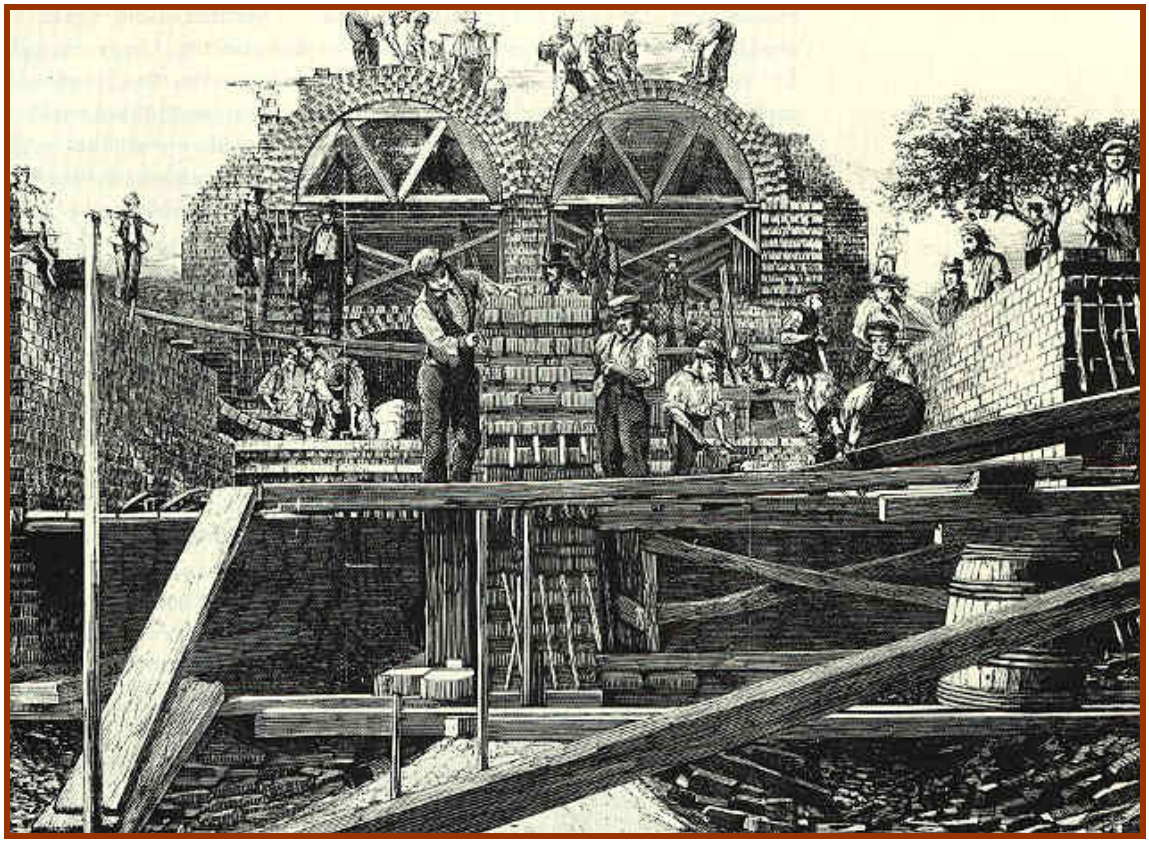
Construction of the Crossness sewage treatment works at Crossness, at the confluence of the Thames and Barking Creek (London page 73)



Abbey Mills pumping station in Venetian Gothic style (London page 74)



Becton under construction 1865 (London page 76)



The tunnels at Wick Lane near Old Ford (London page 77)

The Crossness Works at Becton (London page 79)

Deepening the sewer in Fleet Street, London, 1845

Common Materials used in Water Supply Systems

LEAD, TERRACOTTA AND BRONZE were already in use by the time of the Romans' great engineering feats. These are the most common materials used in water supply systems down the ages:

- ROMANS: Ducts of stone, open ducts of masonry, fittings of bronze; pipes of stone, terracotta, wood, leather and lead.
- FRANCE, seventeenth century: Cast iron pipes were used to supply Versailles; they were joined by bolted flanges.
- LONDON, seventeenth and eighteenth centuries: The New River Company (*see Chronology*) used bored elm logs with spigot-and-socket joints, the smaller tapered end being coated with white lead and driven into the larger end that was reinforced with a larger band. In 1745 the London Bridge Waterworks Company had more than 49,000m of wooden pipe, 3,500m of lead and only 1,650m of cast iron. Thomas Simpson designed the first ball-and-spigot and lead joints in 1785.
- UNITED STATES, mid-nineteenth century onwards: Wooden pipes banded with iron, steel or bronze spiralled around it; pine planks; later cast iron. In 1848 Dr Robert Angus Smith, an Englishman, patented an effective exterior coating against corrosion, combining gas tar, pitch, linseed oil and resin. Wrought iron and steel, especially for larger diameters and lengths, became more common into the twentieth century, not least due to its lightness and ease of handling.
- UNITED STATES AND SPAIN, twentieth century: reinforced concrete became popular for larger diameter mains.
- LARGE PIPES have also been made in cement-asbestos (from 1915), lead, copper, fibrous compounds and plastics.

(Well Washed & Watered, Charles Knevitt, Institute of Plumbing, 1998)

“Work” painted by Ford Madox Brown 1863
Labourers working on the sewers in Hampstead