The Toilet

Progression, Regression or Digression.

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THESIS TITLE : The Toilet
Progression, Regression or Digression.

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Author: Mairead Corcoran

"Science knows that the most fertilizing and effective manure is the human manure....
Do you know what these piles of ordure are, those carts of mud carried off at night from the streets, the frightful barrels of the nightman, and the fetid streams of subterranean mud, which the pavement conceals from you? All this is a flowering field, it is green grass, it is the mint and thyme and sage, it is game, it is cattle, it is the satisfying lowing of heavy kine, it is perfumed hay, it is gilded wheat, it is bread on your table, it is warm blood in your veins"

Victor Hugo, Les Miserables: 1862

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FOREWORD

The history of the toilet paints a fascinating and colourful picture dabbled with amusing anecdotes and animated episodes. Unfortunately, in Western Europe its history beyond 1900 has been little documented. Some data has been published by Shires, Twyfords and Ideal Standard but much of this is purely for the purpose of advertising.

Perhaps the main reason for the lack of published information is the fact that in the last one hundred years, toilet design has become so banal. If one takes a trip around the bathroom showrooms of Western Europe, one cannot help but be confronted by a host of unimaginative designs which possess a distinct sameness regarding function, style and level of comfort. Two options exist at present on the market. One can purchase a toilet which attempts to capture some of the qualities of Victorian styles, for example, cisterns mounted at ceiling level with a chain flush, wooden seats and floral motifs printed onto the bowl and cistern. The other option, is somewhat cheaper to purchase: in shape, its bowl is a simplified version of the Victorian style. Colours are monotone, pastel shades and the cistern can be low level, concealed or close-coupled (see Glossary for explanation of terms).

Some designers have tried to break the mould of conformity. Designers such as Ian Wright and Philippe Starck have tried to take a whimsical approach to the bathroom to open people's eyes to the fact that the bathroom can be a fun place and an area worthy of serious design and stylistic considerations. Unfortunately, I have been unable to discuss either of the above designers' work in this thesis due to lack of immediately available information.

However, at this stage it can be said of Starck and Wright that neither has made a significant impact on the general domestic market.

Wright's products are aimed at wealthy buyers in the domestic market. His products are amusing pieces of sculpture and are beyond the reach, in financial terms, of most households. Philippe Starck, designer extraordinaire, is receiving a lot of publicity at the moment. His work is also for the exclusive end of the market. The bathrooms he has designed are mainly for installation in hotels and restaurants. While his designs are undoubtedly original if not somewhat sensational regarding the general approach to bathroom design, neither he nor Wright has truly improved, in any way, the design of the actual toilet. In fact, if anything, their designs are failures insofar as they are very difficult to clean and very expensive to manufacture and install.

The most famous of Starck's bathrooms is located at the Royalton Hotel in Manhatten. The following is a report written about the bathrooms there:

> "Beautiful to look at. Elegant, round white bath in one corner. In the other a triangular glass shelf and metal sink inset, winged by two huge vertical mirrors. Nice details such as a scalloped indent in the shelf to hold the soap and a metal rose vase built into glass. Customized faucets and two shower fittings. However, the glass shelf itself is tiny and what you can fit on it gets splashed by water from an overpowerful tap. The towel racks are directly over the toilet. Once towels are unfolded there is nowhere to put them".
> (DESIGN Magazine: 1989, p.41)

Unless a manufacturer is aiming particularly at the exclusive end of the market, he/she will conform to the demands of the immutable majority. Due to the expense of its installation, the toilet is not a disposable item, or a product with built-in obsolescence. Thus consumers tend to be conservative in their choice of products since they expect the toilet to last a lifetime in terms of function and style. This reason does not, however, validate an excuse for manufacturers' lack of innovation and problem solving.

Designers and manufacturers should be aware of criteria for efficient

urination and defecation. They should also be aware that the two-gallon flush is not always the best solution and that style and comfort are extremely important to the consumer.

I am not, however, purely concerned with the development of the toilet within the last century. Significant turning points are mentioned regarding styling, and the lack of innovation is emphasized. My main concern lies with the cyclical development of the toilet since the 6th century B.C. Its design, if it is mapped out, tends to reach climaxes, plateau for a while and then plunges. Since the 1950's, sanitary design has been on a plateau. I am concerned that this should be happening, given the level of available technology over the last few decades.

This thesis is not meant to depress the reader, on the contrary it is hoped it will be of interest and draw attention to the current situation regarding toilet design.

Unfortunately, due to the immense pressure of work load and available time, I have not included every area desired. The main area omitted was that of public toilets. I would hope sometime in the future to fully research this topic in a historical context and also to consider toilet design from 1900 to 1990.

INTRODUCTION

This history of the toilet is a convoluted one having reached peaks, depressions and a lot of digressions. The aim of this thesis is to discuss the history of the toilet and its plumbing. I will show that over the past two thousand years, toilets have undergone very little significant development. When we compare ourselves to the Greek, Roman and Egyptian empires and analyse their water systems, we do not appear to have progressed greatly.

The toilet is an object which most people in Western Europe can relate to in some way or another. The associations and affiliations which people have with it vary widely. In 1990, it has become an integral part of every household. From an anonymous refuge, it has been the seat of contemplation, relaxation and the creation or perusal of great works of literature. Yet, since its integration into the household in the 1900's, very little has been written about the toilet and even more importantly very few stylistic and technical changes have taken place to improve the ergonomics, function and aesthetics of the toilet.

Chapter One reviews the plumbing facilities available in ancient civilisations, drawing direct comparisons between the skills and logic of its engineers and builders and those of the 13th, 19th and 20th centuries. The regression that came about after the decline of the Roman Empire in Western Europe is summarized as are the general hygienic habits of the people in medieval times. It also deals with the progress of plumbing throughout the centuries and the gradual re-establishment of the importance of plumbing in society.

The history of the toilet and its inventors, since the early 1700's, is outlined in the second chapter. The developments that occurred and efforts to establish higher hygienic standards in society are discussed along with the assimilation into society of the toilet as a necessary and indispensable part of everyday life. The toilet's role in society and its effects on living standards are compared to those of Roman times, as are the attitudes of people towards the

toilet.

Finally, the third chapter assesses the retardation of toilet design in the 20th century - since the early 1900's there has been little development in toilet technology. The stylistic changes which took place in this century have done little to improve the physical efficiency of defecation. Despite extensive research and detailed recommendations proposed by ergonomists, particularly Alexander Kira, designers have not reassessed the design of the toilet. The progression in terms of styling, technology and ergonomics that should have taken place within the last one hundred years has not occurred. The last chapter investigates why toilet design has not progressed and how it has in fact digressed.

CHAPTER ONE

"Creating Problems for Ourselves"

Dealing with human waste has always been a problem for mankind. When Neolithic man set up his home near rivers and streams, he did so for a number of reasons, primarily for drinking and washing, and secondly, for carrying away waste. Undoubtedly through experience he learned that human waste matter should be disposed of downstream, away from his drinking water..

The Romans and Greeks developed the most sophisticated water systems in the world that have seen no comparison until late this century. Through great organisation and skill, the Romans engineered viaducts carrying fresh water from miles away, elaborate public and private baths, latrines and sewers to carry waste away. Incidentally, most of the Roman engineers and plumbers were women and they usually signed their work. (Pomerantz & Olsztynski, 1988, p.43).

700 B.C. saw the first flushing toilet in the world. This was found in the Greek Palace of Knossos, Minoa. This palace also had four separate drainage systems that emptied into sewers constructed of stone. This royal toilet had a wooden seat for warmth and comfort and a permanent reservoir of water; the bowl itself was earthenware. All this seems to closely resemble the water closets that our parents or grandparents in Western Europe remember.

Water closets too, were found in Egypt which date back to 1370 - 1350 B.C. Of particular interest was one discovered in the bathroom of a house in Tel-el-Armana, belonging apparently to a high ranking official. The unusual feature of this toilet is that the seat has been carved to an ergonomic shape for the buttocks, and is open on one side. (See Fig. 1). This anticipates the development of the Scandinavian ergonomic toilet of the 1970's. An added

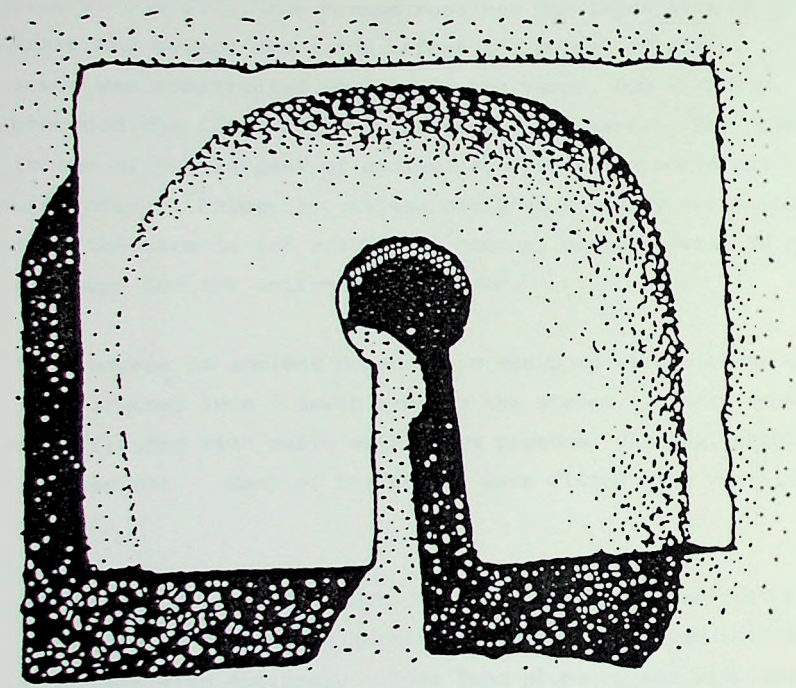


Fig.1

Toilet Seat found in Tel-El-Armana.

feature of the Egyptian toilet is that the seat is made from limestone; this keeps the body cool in hot, sticky climates.

It is from the Romans, however, that we have stolen our knowledge of waterways. The Romans were masters of engineering, the proficiency of their design borne out by their skilled craftsmanship.
Even in 800 B.C., the Romans realised the importance of dealing with waste and sewage above and before the supply of water. The first sewer was constructed in Rome in the years, 800 - 735B.C. This preceded the first aqueduct by about 500 years. The 'Cloaca Maxima' is one of the largest of ancient sewers in the world and is still in use today. Primarily, it was designed to carry off excess water from the streets and waste from houses, and otherwise to provide drainage for the entire city of Rome.

Many houses in ancient Greece were equipped with closets or latrines that drained into a sewer beneath the street. These appear to have been flushed with waste water from personal washing, washing of food, clothes etc. Many of the sewers were fitted with ventilating shafts.

Babylonia (circa 605 - 652B.C.) had some of the earliest plumbers in the world. Bronze was imported, sometimes alloyed with tin, sometimes with antimony. Some lead plumbing was also used.
Streets were planned and houses were built running parallel to the River Euphrates. A variety of toilets appear to have existed. The most common privy consisted of a hole in the ground with a cesspool underneath. This arrangement is still quite common in many countries, e.g. France, Turkey, Germany etc.

Archeologists have also found in Babylonia some more sophisticated toilets. These were to be found in the palace of Sargon the Great. Here was found an arrangement of six toilets having high seats, which brought them off the ground in modern Western style (Plumbing & Mechanical, 1988, p.47).

In 79 A.D., it would appear that water closets were very much the

Fig.2

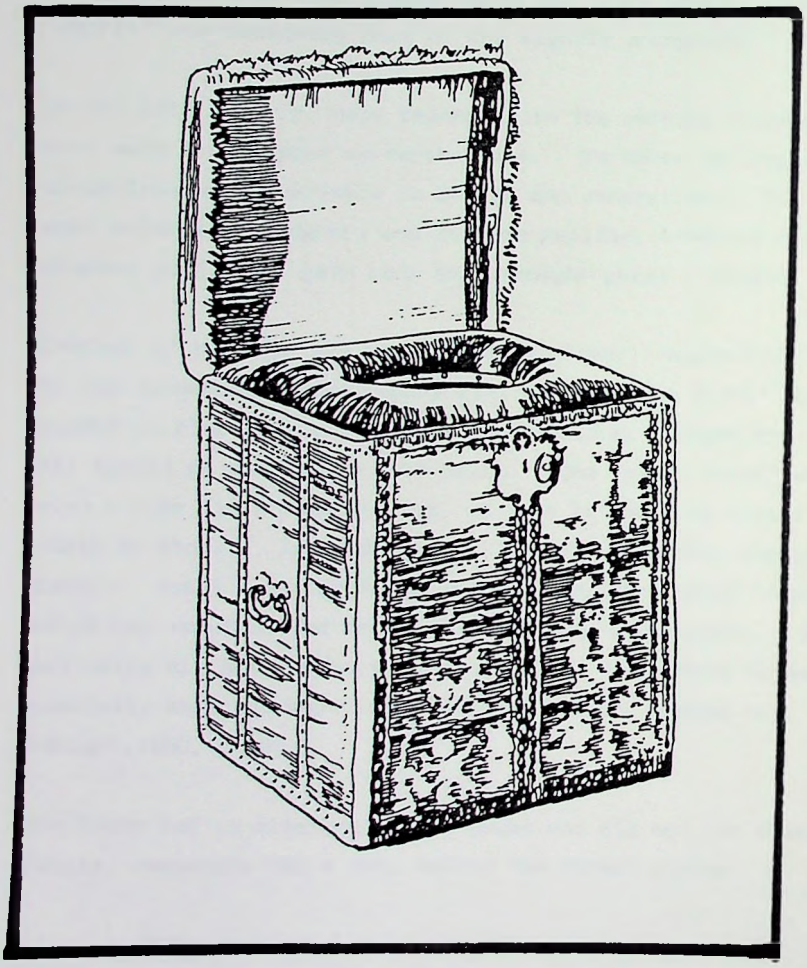
Doctor examining a sample of a patients urine
circa 13th Century.

vogue in Pompeii, especially among the rich. Archeologists have found among ruins, closets with cisterns to flush water and outlines of hinges for wooden seats. For added warmth and comfort, toilets were built near kitchens, particularly near to the ovens. The proximity of the toilet to the cooking area allowed for the easy disposal of garbage and leftovers. The hygienic consideration regarding bacteria seemed not occur to the citizens of Pompeii. All the same, it should be noted that the toilet designs of Pompeii bear an uncanny resemblance to modern toilets. (See Fig. 1).

The Romans, despite their great sewer system and aqueducts, had some rather unhygienic habits. By 300 B.C., the Romans were quite adept at making the closet a place where everyman could indeed be an emperor. There was a variety of toilets to choose from, marble seats, wooden seats, no seats, urinals, toilet chairs with high backs, comfortable arms, carved legs and feet. To wipe one's derriere, a bucket of brine was passed around in which was contained a hockey-shaped stick, with a sponge attached to its end. This activity, as a matter of interest, provided the basis for the expression, "catching hold of the wrong end of the stick". (Pomerantz & Olsztynski, 1988, p.43).

As the Romans plundered their way across Europe to Britain, they brought their plumbing and hygiene habits with them. As the Roman Empire went into decline, circa the 6th Century A.D., so too did standards of hygiene. Public baths fell into disrepair and disrepute. General bodily cleansing was neglected and eventually was frowned upon. The use of toilets across Europe was forgotten, to the extent that the corner of the kitchen became the optimum place to relieve oneself.

This created a new area of employment, the "Peter men". Peter men were employed to go around to homes and scrape the floor, collecting the salt peter which had accumulated there. Among the wealthy, however, chamber pots still remained in use after the decline of the Roman Empire. These "mirth provoking missiles" as the Greek dramatist, Aeschylus, called them, were really more urinals than



CLOSE STOOL circa 1700. Fig.3

chamber pots, due to their narrow necks (Gladstone Pottery Museum). Those belonging to the wealthy were often made from glass. Doctors, in the 13th Century, began every diagnosis with an examination of the patient's urine. The common word for a chamber pot, at this time, was a "Jordan"; this later developed to "Jerrie", "Jack" and "John".

In the 18th Century, the Jerrie as it was then known, was often retained in crevices behind window shutters. After the ladies retired, the gentlemen played cards and drank brandy, thus the "Jerrie" was necessary part of the nightly goings-on.

In the 18th Century, pots belonging to the working class population were made from copper or earthenware. To those willing to pay, variations were available in design and decoration. The Victorians were wizards of gadgetry and for the wealthy, invented musical chamber pots, that gave many an overnight guest a fright.

Comfort of the user was not neglected either; apparently, according to the Gladstone Museum, Henry VIII had a "close stool" which was padded in black velvet, trimmed with ribbons, fringes and quilting, all tacked on with 2,000 gilt nails. The "close stool" was a pot with a wide lip around its top, so that it could be fitted into a chair or stool. In principle, it closely resembles commodes used today. James I was quite possessive about his potty (chamber pot), which was manufactured from silver and was very ornate. When he was not using his pot, he kept it in a leather box, which he had specially made and kept it locked shut with a special key. (Wright,1960, p.70).

The Scots had an alternative for those who did not own chamber pots. People, desperate for a job, walked the street crying,

"Wha wants me for a bawbee?"

with a pail in one hand and a cloak in the other. The cloak was used to cover the customer as he or she availed of the services. (Pomerantz, 1989, p.89)

The disposal of waste was always a problem. Unlike the Greeks and Romans, the British did not think of building sewers. Waste matter was thrown out of windows and one's rubbish tip became the world at large. Much to the discomfort of passers by, contents of chamber pots were aimlessly flung from windows. Eventually, a law was passed which decreed that persons emptying pots should give due warning first to passers by, by shouting "Gardez l'eau". This, in time became abbreviated to the now familiar slang for toilet "loo".

The Romans, as previously discussed, realised that waste water should be dealt with properly and kept away from fresh water. Hippocrates, the father of medicine, in C.350 B.C. (Pomerantz & Olszynski) recommended the boiling of water before it was consumed. Stone Age man had realised that waste should be disposed of downstream, circa 2,000 B.C., On the Scottish islands of Orkney, stone huts had crudely hewn drains resembling medieval garderobes, which disposed of waste into ditches away from huts. 1500 years later, man regressed to flinging his waste into his neighbour's garden, aimlessly digging drains near wells, and otherwise burying waste in badly built, badly maintained, unventilated pits beneath his house.

In the 1830's, with the onset of the Industrial Revolution, 2½ million people crowded into London. People lived cramped together, rooms were small and ventilation poor. Due to the taxation system, houses had few windows, since the greater number of windows, the greater the tax the occupants had to pay. Thus the level of sanitation fell well below that of the countryside. According to a report by R.H. Moltran, in early Victorian Leeds in 1830,

> "568 streets were taken for examination: 68 were paved; 96 were neither paved drained nor cleaned; one of them, with 176 families had not been touched for 15 years. Whole streets were floating with sewage; 200 were crossed with clotheslines; over 500 cellars were in occupation. 156 rudimentary schools provided for 7,000 children; the Sunday schools took in 11,000; 15,000 went altogether untaught. Finally, we learn

> there were 451 public houses, 98 brothels, 2 churches and 39 meeting houses. The death rate in the clean streets was 1 in 36; in the dirty streets, 1 in 23".
> (Wright, 1960, p.144)

A service was set up to deal with relieving the city of its overflowing cesspits, "Nightmen". These gentlemen carted loads of waste away; originally, they brought the waste away to the countryside for use as fertilizer for farms. As London grew bigger, it became impossible to cope with carting all of the waste out, so communal cesspits had to be built. Failing the availability of a large cesspit, the local river would be used, disregarding the fish, the plant life and the likelihood that the same river would be used as a source of drinking water. Once again, we see man in his pursuit of technology and power regressing to pre-Stone Age habits, as regards domestic issues.

In 1848, the government did lay down some laws and regulations. (Reid, p.58) As the Fleet River turned completely into an open sewer, only then did the government recommend that it should be covered in. Prior to this, came the introduction of piped water to the home. Naturally it became a status symbol to have this luxury, so all the richest households installed pipes rapidly.

Cholera, at this time, was rampant in Asia. Slowly it spread across Europe. The English refused to even entertain the thought that it could affect them. After all, this was an Asiatic disease. Water is by far the easiest means of spreading the disease and one source can contaminate a whole community should everyone in that community be availing of related sources. In 1832, cholera struck dramatically, causing devastation and detriment. It struck again and again until 1866, when at last people realised that the "modern" water supply system was responsible for spreading the disease.

Cholera was by no means the only disease which the upper class had to worry about. Enteric fever and typhoid still lingered, especially in the upper classes. It became apparent that some urgent reform of the plumbing system was needed when England almost lost Edward VII,

heir to the throne in 1871.

The Prince had been staying with a wedding party at Londesborough Lodge, when all the guests came down with typhoid fever. The recovering prince was afterwards much quoted as saying,

> "If I could not be a prince, my next preference would be to be a plumber"
>
> (Wright, 1960, p.210)

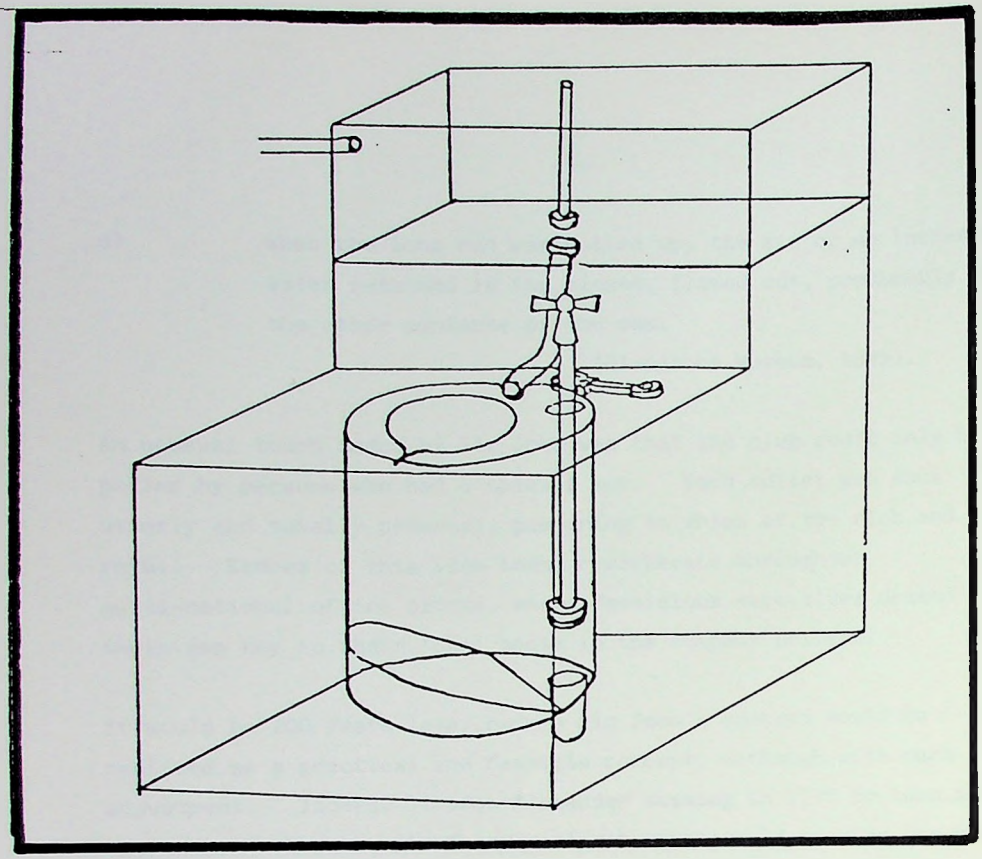
Typically, only when the rich and royal fell ill, did the government begin to reform and set amendments and standards for plumbing. Once again, the status of the plumber was elevated to almost parallel to that of emperor, such as it has not been since Roman times.

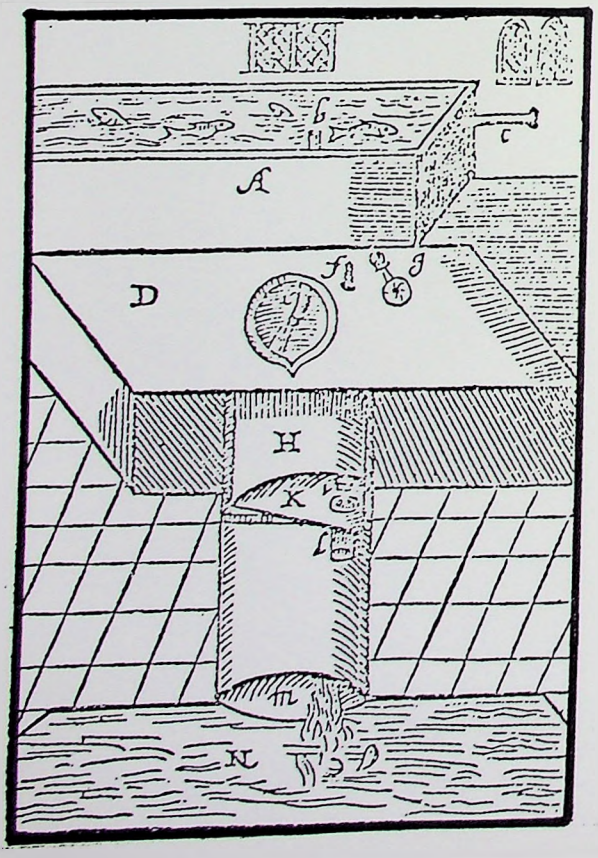
It would be foolish to think that everyone in Britain from Medieval times to the 1800's was ignorant of water systems. Sir John Harrington installed a type of watercloset in 1594 in his home at Kelston near Bath. This closet he designed himself. He also wrote a book in 1596, pertaining to sanitation entitled, A new discourse on a stale subject called the Metamorphosis of Ajax. Ajax was a pun on "a Jakes", the colloquial term at that time for toilet. The book and Sir John were ridiculed and Sir John became known as Sir Ajax! The principle of operation of the closet was as follows:

a) The pan was filled by lifting a rod-plug from inside a rectangular cistern.

b) Water then flowed down a pipe into the pitch-covered lead pan, under the seat. (This pan of oral section had a sloping bottom with a plug-hold in the lowest part).

c) The plug for this was at the end of a long rod to which a handle-key was attached.





Above and Left
Diagram and patent drawing of Sir John Harringtons watercloset of 1594.
Fig.4

d) When the long rod was pulled up, the six or so inches of water retained in the closet, flowed out, presumably with the other contents of the pan.

(Gladstone Museum, 1881).

An unusual touch added by Sir John was that the plug could only be pulled by persons who had a special key. Each toilet was thus utterly and totally personal, pampering to whims of the rich and royal. Echoes of this idea today reverberate throughout multi-national office blocks, where fastidious executives demand their own key to their 'own' booth in the company toilets.

It would be 200 years later before Sir John's concept would be realised as a practical and feasible concept, although with much adjustment. Indeed, it took Alexander Cumming in 1775 to take a new approach to the concept of water closet which would provide the basis for the toilet design as we know it today.

CHAPTER TWO

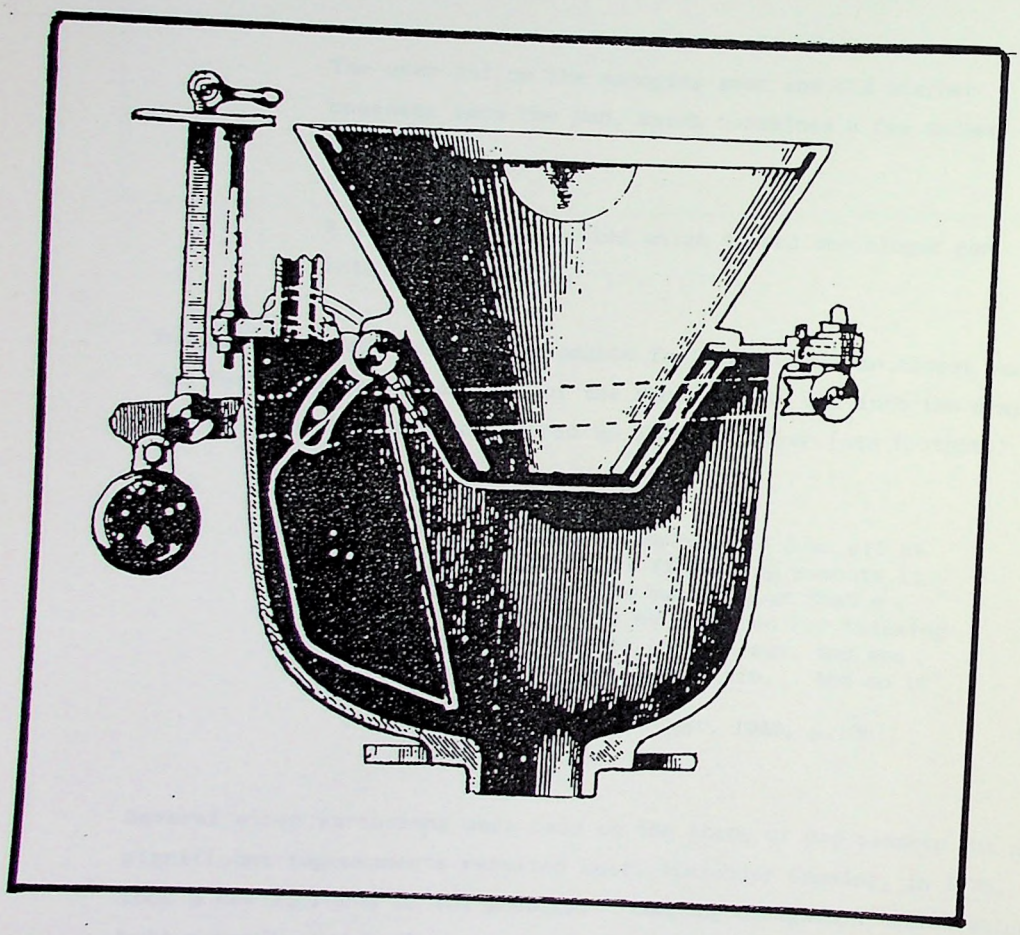
The Development of the Toilet as we know it

Let me begin this chapter by first referring to a small matter relating to public belief about a certain gentleman known as Thomas Crapper. Apparently it is commonly believed that Thomas Crapper was responsible for the invention of the toilet mechanism as know it today. This is not true; Thomas Crapper did exist but he was most likely a foundry owner and plumbing merchant. As for the origin of the colloquial term "crapper" for toilet, this officially came into recorded use in 1846, at which time Thomas Crapper would have been nine years of age. (Pomerantz, 1988, p.68).

The Thomas Crapper myth was created by a certain Wallace Reyburn, in 1969. Wallace Reyburn published a biography, Flushed with Pride: the Story of Thomas Crapper. Many prestigious people and educational institutes fell for this literary hoax as historical fact.

The real inventor of the toilet was Alexander Cumming. In 1775, this London watchmaker announced his application for a patent for a watercloset. From there the issue snowballed. Designs came fast and furious between the years 1775 and 1850. After 1850, things slowed down considerably and toilet design lay dormant.

Previous to Alexander Cumming, in 1775, a number of developments and improvements had been made on the close stool. These were not worth taking out patents, however, since they had rather obvious defects. A type of closet existed in France in the early 1700's; it had been thought that these originated in England. However, Blondel, in 1738, made some enquiries among his friends who had travelled to England. They replied that they had never come across such items on



The Pan Closet Fig.5

their travels.

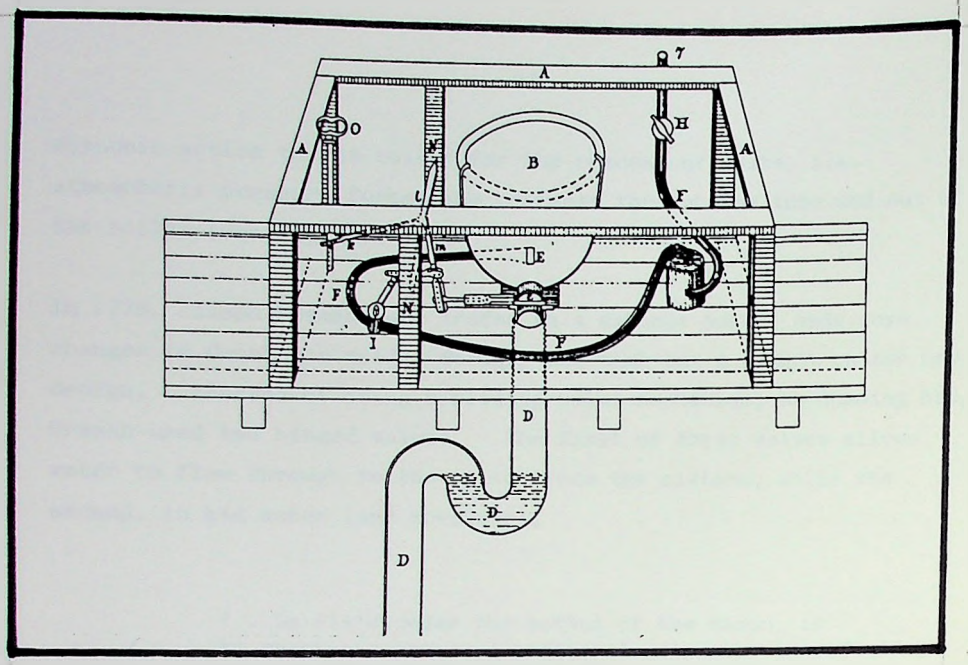
What had been in some use in England at this stage was the pan closet. The pan closet was installed in a limited number of houses because it was expensive to install, difficult to clean, inadequately ventilated and, hence, was somewhat odorous. (See Fig. 5, for drawing of the pan closet). The principle of operation was as follows:

> The user sat on the mahogany seat and did his/her business into the pan, which contained a few inches of water.
>
> A lever was then pulled which tipped the hinged pan into a drain below.

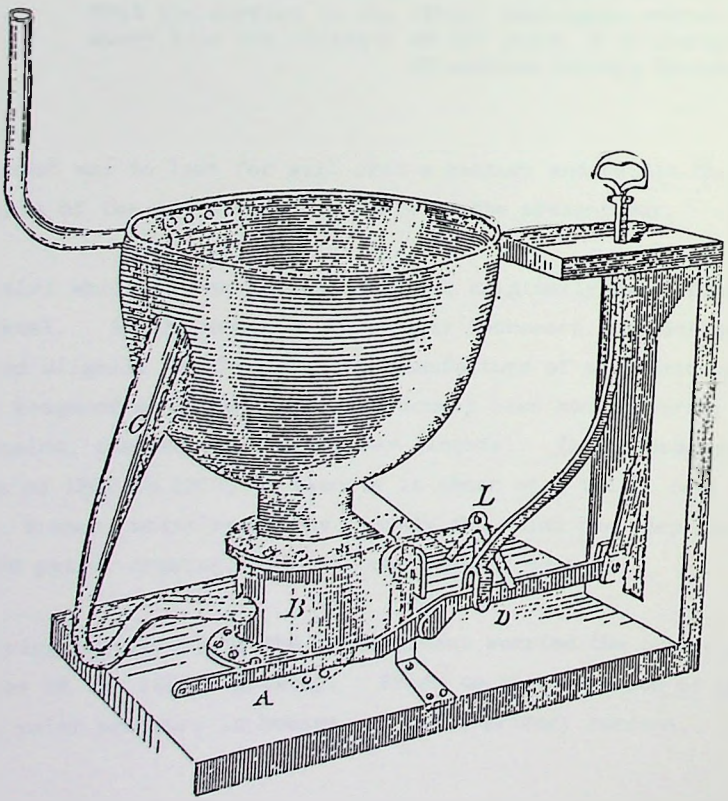
The most noticable and objectionable fault with the pan closet was the fact that rarely did all of the contents tip out into the drain, as was most eloquently described by Steven Hellyer (see footnote)

> "The light of a candle does not die down all at once. Often in its last flickering moments it extends its flame with so much vigour that a stranger to its ways may be pardoned for thinking that it had recovered its lost energy, and was coming back to life and light again. And so it is with the pan closet.
>
> (Wright, 1960, p.106).

Several other variations were made on the theme of pan closets but no significant improvements resulted until Alexander Cumming, in 1775, took a new approach to the problem. Cumming designed a toilet which held water in the bowl by means of a sliding valve underneath. Contents of the pan were emptied by pulling a lever and simultaneously fresh water was admitted to the pan. Perhaps the most significant aspect of his design was the "S-bend" which he termed as a "soil pipe". This soil pipe offered a certain amount of



Cummings Water Closet ,1775
Fig.6



The Bramah, Designed in 1778.
Fig.7

siphonic action to the toilet for the removal of waste, i.e. atmospheric pressure forces the contents through the tube and out of the toilet (See Fig. 6).

In 1778, Joseph Bramah, who traded as a cabinet maker, made some changes to Cumming's toilet designs and took out a patent on the new design. Instead of using a sliding valve mechanism, as Cumming had, Bramah used two hinged valves. The first of these valves allows water to flow through to the toilet from the cistern, while the second, in his words (and spelling),

> "...is fix'd under the bottom of the bason, is to reserve a proper quantity of water therin and by that means cuts of(off) all communication of smell or stench which might otherwise arise from the soil pipe, drains or sesspool; this valve moves on a horizontal axis and in such a direction that its surface is the (then) thoroughly washed every time the contents of the bason is discharged". (Gladstone Pottery Museum).

The Bramah was to last for well over a century and retain the principle of the operation of toilets to the present day.

The toilet which Bramah had designed was originally made completely from metal. As the Bramah's popularity increased, the design was modified slightly to allow for the manufacture of a ceramic pan. Josiah Wedgwood and Company had previously been manufacturing ceramic wash basins, champer pots, and water closets. In the Wedgwood shape records of 1802 to 1807, an example is shown of a toilet bowl made for Mr. Bramah, which resembles closely the metal bowl depicted in the 1778 patent drawing. (Gladstone Pottery Museum).

The growing popularity of the water closet worried the public work companies of the 1800's greatly. Prior to the invention of the Bramah, water pressure in houses was not a primary concern.

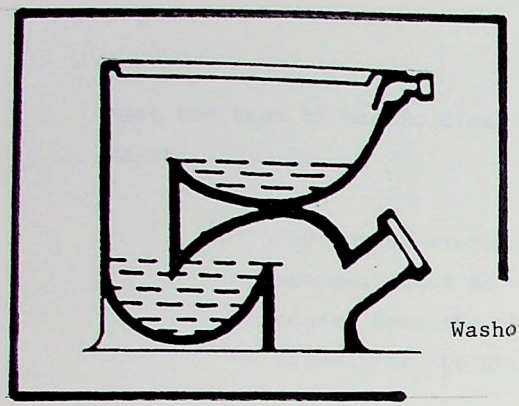
Waterpipes were therefore manufactured from locally available, easily processed materials that were cheap, i.e. wood, particularly elm. To cope with the growing demand water companies had to develop water pipes made from iron, bored stone, concrete and fired clay. As a point of interest, the Romans, Greeks and Egyptians almost always used metal or stone for the manufacture of pipes. On the same theme, water pressure was always of particular importance to the Romans.

It should be noted that the Great Exhibition of 1851 was significant in so far as it gave the opportunity to many inventors and manufactuers to exhibit their work. It was even more significant, however, in so far as it gave many visitors the chance to use a flushing toilet. It also marked the resumption of proper fixed public toilets, a rare sight since Roman times. These had been installed by George Jennings and, apparently, 827,280 (14% of visitors to the Great Exhibition) paid for their use, bringing about the expression, "spending a penny". An official report regarding the installation of these facilities, states:

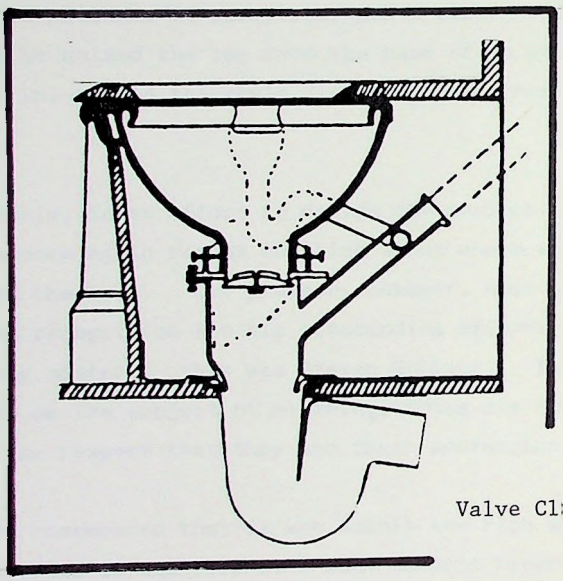
> "No apology is needed for publishing these facts which .... strongly impressed all concerned... with the sufferings which must be endured by all but more especially by females on account of the want of them".
>
> (Wright, 1960, p.200).

After the Great Exhibition, a number of variations of the Bramah were introduced, namely the "Hopper Closet" and the "Washdown and Washout Closets". (See Fig.8). In 1884, a Health Exhibition was held in London; by this time toilet frenzy had thoroughly caught hold. Variations and creations of every shape and form of toilet were being designed and manufactured. A rather daring type was patented in 1853 by a certain O. Williams. This closet used a gas burner to incinerate solids and send off urine as steam.

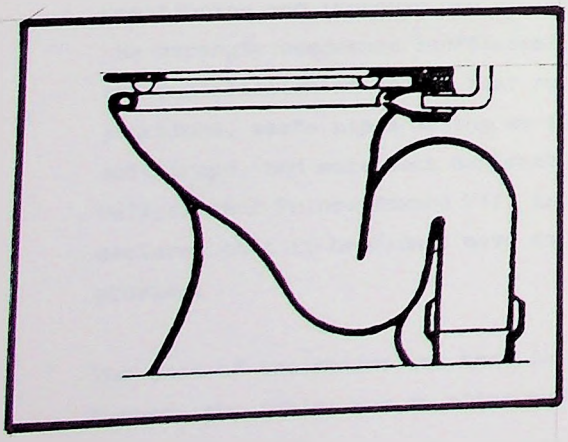
A standard test was established to certify a toilet as perfect. To



Washout Closet Fig.8



Valve Closet Fig.9



Washdown Closet Fig.10

pass the test it had to clear the following with two gallons of water:

> "10 apples averaging 1¼ ins. diameter, 1 flat sponge, about 4½ ins. diameter, plumbers smudge coated over the pan, 4 pieces of paper adhering closely to the soiled surface".
>
> (Wright, 1960, p.204).

A rather impetuous young Mr. Shanks, anxious to show off his design had not the patience to carry out such a test. According to all accounts, he seized the cap from the head of an attendant apprentice, thrust it in, pulled the chain, saw it go and cried happily, "It works!"

Unfortunately, in an effort to design the perfect toilet our ancestors once again forgot to think about where waste should go once it cleared the bowl. One plumber, however, must be given fair credit and recognition for his outstanding efforts to educate people on plumbing matters; this was Steven Hellyer. This far-sighted man wrote much on the subject of plumbing, doing his utmost to gain for plumbers the respect that they and their profession deserve.

It must be remembered that it was mainly the rich who were able to install toilets in the 1800's. When enteric fever and typhoid became rampant among the upper classes, Hellyer blamed the positioning and improper use of toilets and drains for the outbursts. He strongly condemned inefficient pan closets that wre still in use, the installation of drains that run uphill or through right-angled junctions, waste pipes acting as flues for sewer gas and unventilated soil traps, and more such deplorable practices. Indeed, it was to Hellyer that Prince Edward VII, in 1871, gave tribute when he declared that if he didn't have to be a prince, he would be a plumber.

The fact of the matter was that in the late 19th Century Western Europe, the toilet was an alien product to people. People did not

know how to treat it, i.e. how to install it, under what conditions and where it should be installed. The transition from chamber pot did not alter the underlying problem of how and where to dispose of waste; it simply added to the user's comfort and reinforced the all too common "out of sight, out of mind" attitude. It took many more years of trial and error for plumbers to design and install sanitary systems that would be hygienic and easy to clean.

By the early 1900's, the cases of typhoid and cholera, amongst those having toilets in Britain, wre almost non-existent. Finally, safe standards and recommendations were drawn up regarding toilet and waste pipe installations.

Despite the fact that the toilet in the 1900's became an established part of the household, people still had little idea of how to treat this product. Was it a piece of furniture? Was it an ornamental machine? Or was it an unsightly, cold item for the unmentionable to be kept out of sight, i.e. in the outhouse? The same problem was true for manufacturers as well as householders. Designs, as a result, were modifications of close stools, i.e. were treated as a chair upon which one sat and either urinated and (or defecated). Ergonomics were unheard of in the early 1900's, no studies had been carried out to determine the best shape for sitting on or whether one should sit at all for the purpose involved.

As discussed in Chapter One, the Egyptians obviously had carried out some studies in this area, since toilets have been found there with limestone seats, carved to an ergonomic shape.

It appears that various attempts were made to somehow disguise this implement for such an unmentionable purpose. Manufacturers' shape books from the mid 1900's record a huge variety of patterns and motifs that could be applied, mainly floral, to make this object more attractive to the average householder.

The mid 1800's were, however, years when ornamentation was applied to every square inch of space. The decoration applied to toilet bowls

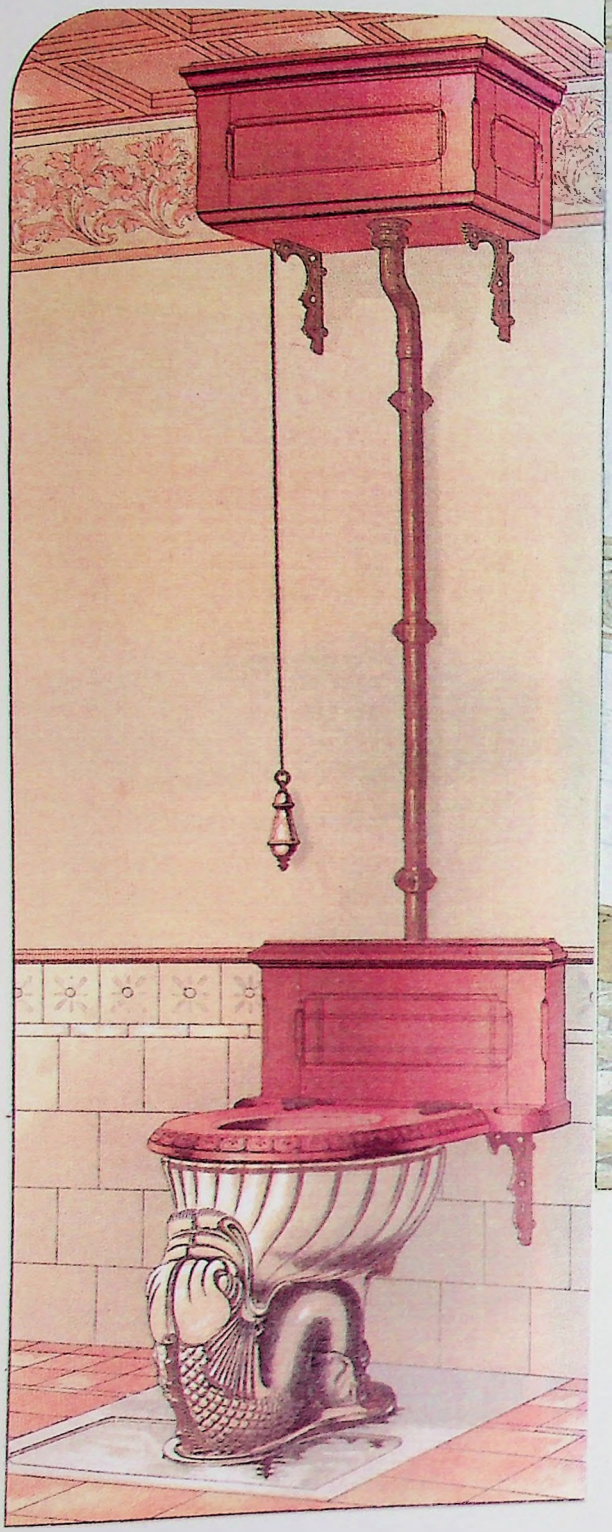
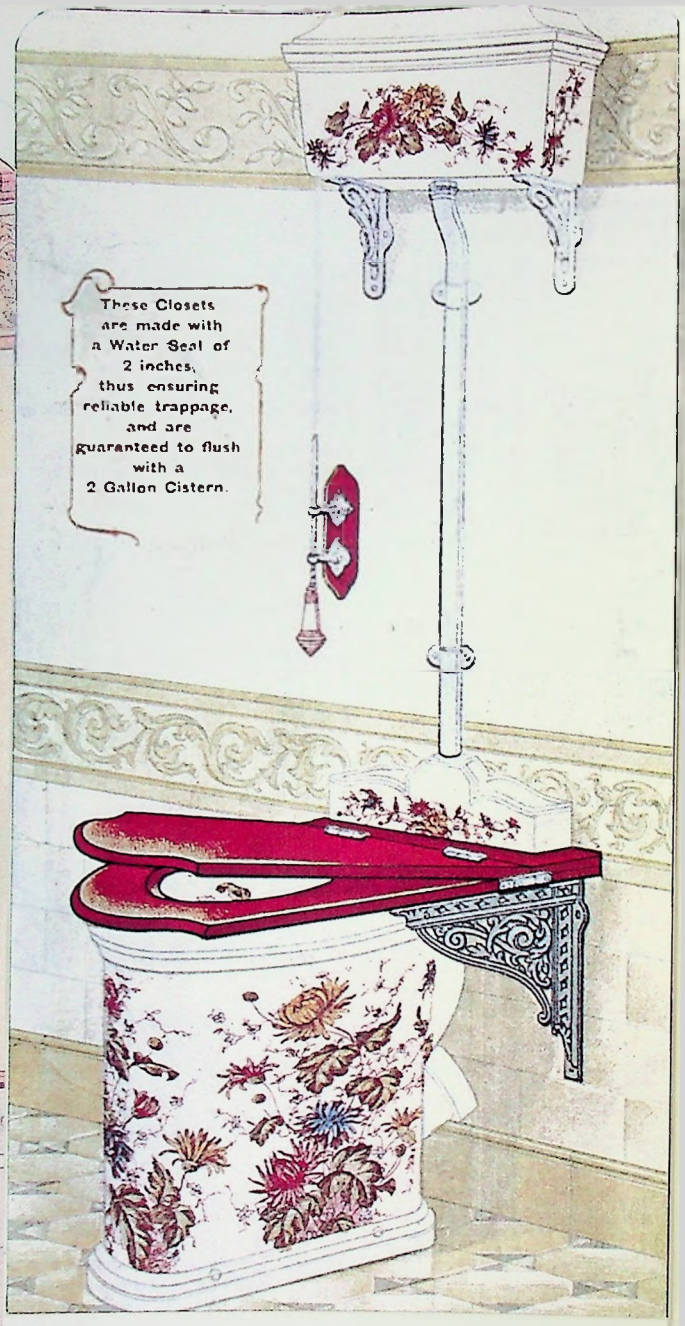


Fig.12
Dolphin pattern lavatory bowl
circa 1880.



Above Fig.11
Exquisitively decorated Armitage
Shanks lavatory and matching
cistern.

varied from the simple repeated floral motif to the simply ridiculous myriad of entangled flowers, to the sublime , willow patterned bowls. (See Fig.11).

Variations in shapes and mouldings were also available. Of particular fame are the "Lion" and "Dolphin" shapes. Also produced were toilets on pedestals, evocative of regal themes, a seat where every man could be a king.

CHAPTER THREE

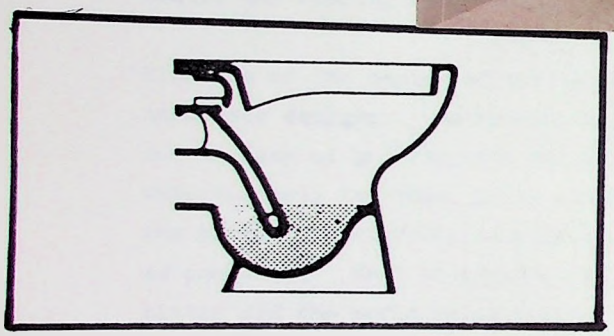
The Stall of Development

The hundred years from 1890 to 1990 have witnessed very little development in toilet design. The obsession with creating water systems in times of Greek, Roman and Egyptian empires, and again in Western Europe (1775 - 1890), appears to have faded and died away. In the 1990's, we are content to rely upon the principle worked out by Cumming and Bramah for the operation of the toilet, i.e. the S-bend, the cistern and the flush out system.

Some variation on these principles has taken place and some of the recommendations and standards established in 1856 have been reviewed and redrafted several times, i.e. in 1875, 1890, 1907, 1925, 1936, 1961 and 1970. (Gladstone Museum). In comparison to the work done by engineers and designers from previous times our input regarding the improvement and development of the toilet has been minimal. It would appear that we have digressed from concentrating on improving the design in terms of function, ergonomics and efficiency and have instead invested our time on styling and gadgetry.

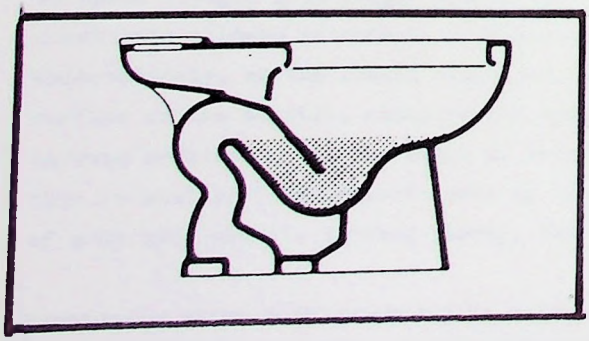
However, some variations and alternatives to the existing toilets have evolved in the 20th Century. These toilets include: the washdown closet, the siphon-action toilet and the vacuum water closet. (See Fig.13). All these, except for the vacuum water closet, use a minimum of two gallons of water. The standard at the Health Exhibition of 1884 in London stated that toilets must not use more than two gallons of water to clear a specified amount. (Wright, 1960, p.204). One cannot help but wonder would a toilet of current production pass this test.

The vacuum water closet was developed in the 1960's. Several attempts were made to market it worldwide but it only really made any impact in its indigenous land, Sweden, and in some Central American countries. The main feature of this toilet is its economy of water, i.e. it uses only one litre of water. In the words of Ray Palmer,



Above Fig.13
Washdown Closet.

Left Fig.14
Siphon-Action Toilet.



the operation is as follows:

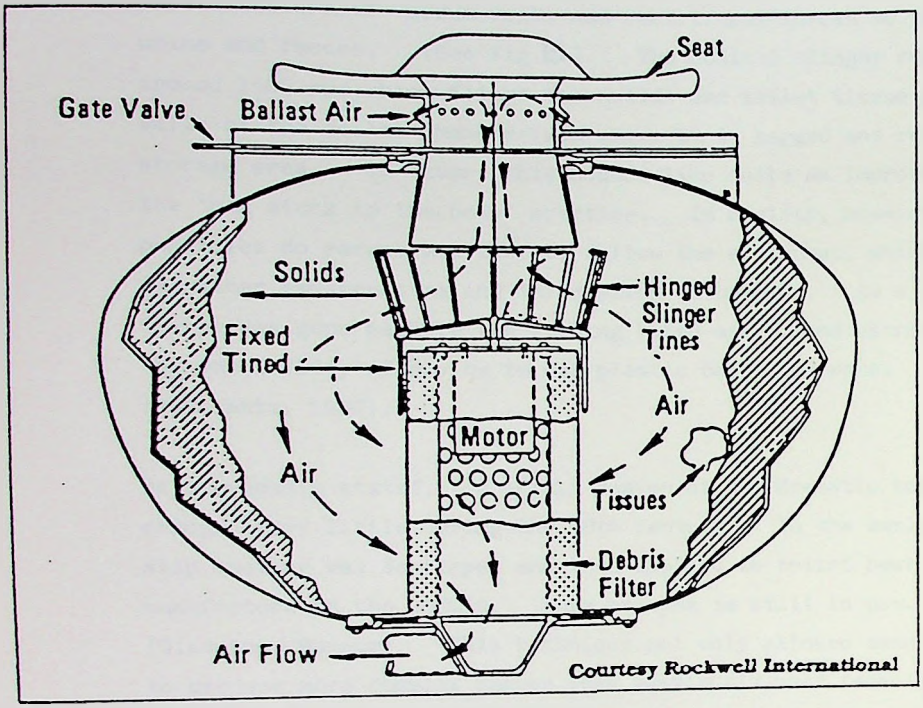
> "Flushing, which is started by a pressure button control at the back of the bowl, admits air at normal atmospheric pressure into the system and the detritus in the form of a 'liquid plug' is thus propelled efficiently and speedily to a collecting tank".
>
> (Palmer, 1973, p.126).

The problem with this toilet is that it is expensive to install and, like all other toilets is noisy, resulting in apprehension felt, as one lowers the level gradually, at three o'clock in the morning, and awaits the roaring Niagara Falls!

Elements of the design of the vacuum toilet were taken and tried in aerospace designs. Astronauts have always had a particular problem, due to lack of gravity with relieving their bladders and bowels. Unfortunately for them, petty minded officials have refused address the problem, preferring to giggle and pass over the topic as briefly as possible. What courageous explorers Armstrong and Aldrin were. Little did the world below realise that in 1969, the advent of the moon voyages, that astronauts had to contend with a plastic bag attached with adhesive to their buttocks.

If that wasn't bad enough they were also obliged to mark their bags and freeze-dry the contents for analysis back on earth by scientists. As space voyages grew longer and fridges began to get crowded, scientists allowed astronauts to dispose of urine out of the shuttle. Unfortunately, as the liquid vaporized, salts were deposited on the surface of the shuttle, clouding the windows and thus this led to landing problems. In the light of this knowledge, one wonders if this is what official reports mean by 'cloud cover' being the cause of a delayed shuttle landing (Loewy, 1979, p.205).

Eventually after much grumbling by astronauts, designers returned to the drawing board in 1969. Rockwell International Ltd. looked to the vacuum closet for inspiration. The toilet they came up with



The vacuum Toilet Fig.15

Right Fig.16
Toilet designed by Gio Ponti
in 1954 for Ideal Standard.

uses a mixture of vacuum vents and centrifugal forces to take in urine and faeces. (See Fig.15). The conical slinger rotates at around 1500 rpm which flings the solids and toilet tissue against the walls of the toilet chamber from where it is bagged and removed to a storage area. In theory this sounds like quite an improvement on the 'bag stuck to the body' practice. In reality, however, some particles do escape and tend to follow the astronaut, which has led to rather embarrassing and infuriating situations. As a result, the design has gone back to the drawing board again, and astronauts face the possibility of having to use plastic bags once more. (Pomerantz, 1987).

As previously stated, the actual design of the domestic toilet has changed very little during the 20th Century. In the early 1900's, slip casting was developed and then applied to toilet bowl manufacture in the 1920's. This process is still in use. (Gladstone Museum). This technique not only allowed manufacturers to produce more complex shapes than previously used techniques but it also was a cheaper process and thus, toilets became more available to a wider range of people. Ironically, with the evolution of improved manufacturing facilities, complicated mouldings became less fashionable. The emergence of Art Nouveau and Art Deco dictated that designs be a 'sophisticated stylization of natural forms'. (Bayley, Garner and Sudjec, 1986, p.45).

In the 1950's, Italian design flourished and had a universal influence on the theory and practice of design, particularly aesthetics. (Bayley, Garner and Sudjec, 1986, p.175). Luigi Colani and Gio Ponti, in particular, were responsible for the shape adopted for toilets after 1950. Should we compare the toilet in Fig. 16, designed by Gio Ponti for Ideal Standard in 1954 with those produced by the same company in 1990, or those produced by Twyfords, Shires etc., it becomes obvious just how insignificantly the toilet has changed.

Despite the extensive research carried out by Alexander Kira in 1966, regarding bathroom design, the shape of the bowl as an ergonomic

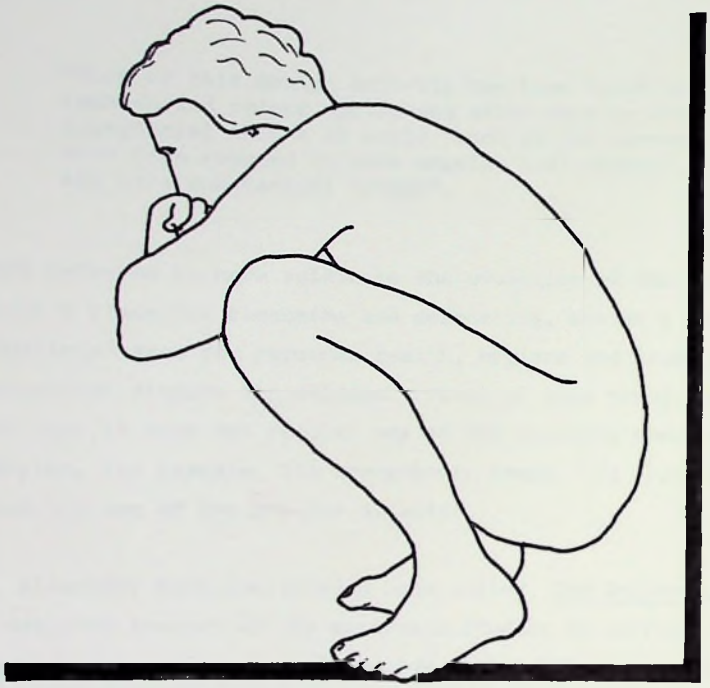


Fig.17

The squatting position.
This posture is employed by Asians and many East Europeans. According to Alexander Kira, it is the best postuere for defecation.

piece of design has not been exploited by designers or manufacturers. According to an article entitled "Room for Improvement?" in Design Magazine, (1988, p.20):

> "Much of this design activity has been based on fashion led colour cycles and other more or less superficial shifts in style (such as the current move from rounded to more angular bowl-shapes), are more substantial trends".

The trends referred to here relate to the evolution of the bathroom as not just a place for cleansing and defecating, but as a multi-functional area for personal health, hygiene and grooming. While one cannot dispute the welcome arrival of this trend, it must be argued that it does not resolve any of the existing problems with toilet design, for example, its unergonomic shape, its flushing noise, and its use of two gallons of water.

In 1966, Alexander Kira published a book called, The Bathroom, which gives a detailed account of the ergonomic studies he carried out relating to bathroom design. This book deals with the historical and physiological aspects of cleansing, the anatomy of urination and defecation, and also design criteria for the above.

In brief, it appears that the optimum position for defecating is, in fact, the squatting position, as practised by many East Europeans and Asians. In response to this information, some manufacturers tackled the issue by lowering the fixing height of the bowl from 405mm to 380mm. However, this lowering of the bowl does little to improve the efficiency of performance. Apparently, the most appropriate method of defecating is to squat with one's legs wide apart, this allows the aperture of the anus to widen as peristalsis commences. According to accounts from various users, who have travelled in Eastern Europe it also reduces the need for the use of toilet paper. Mosses, rags, tissue paper etc. which have been used in Western civilizations are not so readily available in desert environments. (PLUNKETT, David, 1989).

Public facilities, particularly in Ireland, have not been developed or renovated since the turn of the century. Many have been closed down and others allowed to fall into disrepair. The following is a newspaper report, stumbled upon recently,

> "When Mr. Gordon McLeod sat on a lavatory at Glasgow Public Baths, the front of the pan broke away and he fell onto jagged china, suffering serious cuts. He received 51 stitches in his buttock wounds, spent three days in hospital and was off work for two months".
>
> (Daily Telegraph: 12 March 1970)

One wonders how such an incident could occur in 1970, one hundred years on from the invention of the water closet and the establishment of public facilities. Even twenty years after this incident, in 1990, if one examines toilet facilities to ascertain whether this incident is likely to recur, one can conclude that its recurrence is, in fact, highly likely.

We are still faced with the same material, vitreous china, and the same conditions in public toilets, i.e. slippery floors, and inadequate facilities for the elderly.

Instead of tackling problems of shape, size and sequence of operation, designers in the late 1980's have turned their attention to toilet gadgetry. Classic examples of such types of toilet were to be seen at the 1988 Japanese Toilet Exhibition in Tokyo. According to a report in the Irish Times, (28 November, 1988), the highlight of the show was the "Washlet Queen". This amazing piece of gadgetry has a heated seat and is also a bidet. It washes one's front and back, with remote-controlled sprinklers, it then dries the derriere with a blast of warm air and also has a built-in deodorizer Other such toilets exhibited included "The Rose of Versailles", decorated with pink roses all over, whose blooms exude a rose fragrance. The "Sound Princess" plays recordings of flushing water. Apparently this toilet is aimed at the shy, who wish to mask

embarrassing noises with flushing sounds. Lastly, one can also purchase a urinal which is built into a one-way mirror. Also being developed are urinals which analyse and report on blood pressure and heartbeat. None of the above, it will be noted, make any mention of an ergonomic toilet, a toilet which is easier to clean, a toilet that will use less water, that will have improved plumbing facilities or that will be less noisy.

The "Rose of Versailles" is the epitome of evasive design. For centuries it has been our habit to disguise a smell rather than eliminate it. In the 18th and 19th centuries, pot pourris , Eau de Cologne and perfumes were used in homes to disguise the obnoxious fumes that rose from beneath the floorboards. In 1990, masking products are still commonly used in bathrooms. Household bleaches, highly perfumed disinfectants, aerosols and solid deodorants are currently being used by most households to eliminate bathroom odours. Little do people realise that in their efforts to keep the bathroom a seemingly cleaner and more pleasant place, they are, in fact, compounding the situation. According to environmentalists, the use of aerosols containing chloro-flourocarbons can permanently damage the ozone layer. Consumers and manufacturers, however, continue to ignore the facts and insist upon designing and actively advertising such products as the "Rose of Versailles" toilet.

The use of disinfectants in toilets can have a detrimental effect on the microbial community responsible for the breakdown of noxious elements in sewage (Earthwatch 1990). During the 1960's, the cess pit became known as the septic tank. As in the former part of the century, once waste has cleared the bowl, little thought is given to its destiny. Once, all plumbing from a household led to a private cesspit or to a sewer which transported it to a communal cesspool. Today, most household drains lead into a sewer, from where waste is transported to a C.P.P (central processing plant). Many houses though cannot, for economic reasons, be connected to the C.P.P., so must use septic tanks. Few changes in reality have taken place since they were known as cesspits.

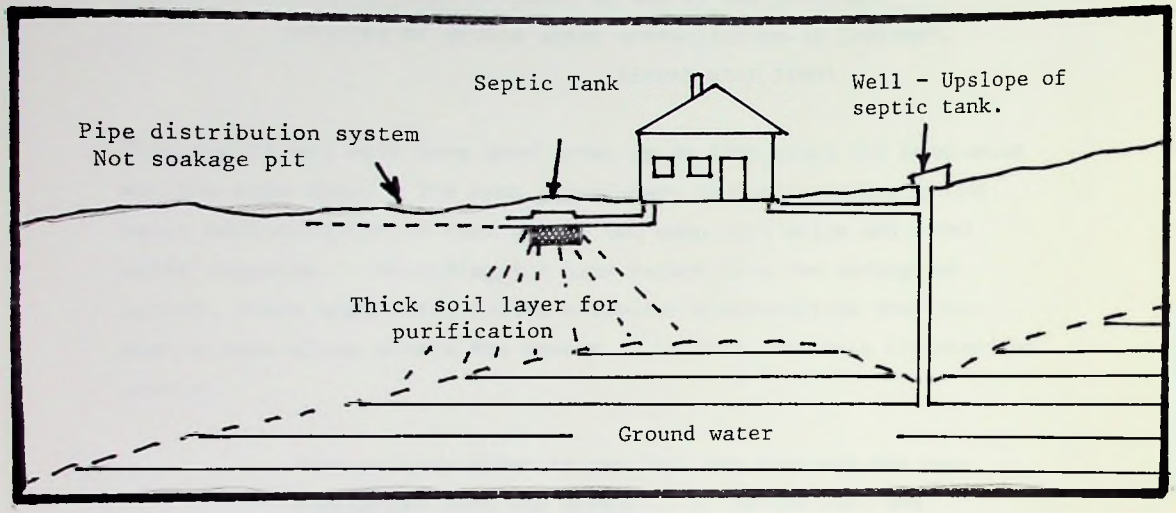


Fig.18

Correct layout of fresh water and septic tank system

cesspits.

Strict regulations were drawn up in Ireland, circa 1965, regarding how and where a pit should be dug. Unfortunately, more often than not, these regulations are not adhered to. According to a report from the Geological Survey of Ireland,

> "Septic tank effluent is one of the principle sources of ground water contamination in Ireland".
> (Earthwatch 1990).

This report may well have been drawn up in 1700 since the conclusion was the same then. The most significant factor regarding ground water contamination is that sewage can seep into wells and local water supplies. According the same report from the Geological Survey, there apparently exists a popular misconception that the septic tank alone treats the sewage. In fact, the main treatment of sewage,

> "occurs only after it has left the tank and has been discharged into the ground. It is the soil and surficial deposits which are relied upon to treat effluent and render it harmless".

Very few soil types are suitable for this type of filtering, i.e. in the United States of America alone, only 32% of the total land area is suitable for the safe usage of septic tanks.

For those of us, who depend upon the government facilities for disposal of our waste, little thought is given to where the waste goes. Generally, a great deal of it goes to a central processing plant where it is rendered harmless and pure water is taken off. In Ireland and England, we still pump raw sewage into our seas. As a result, beaches in certain coastal areas have been ruined and thus we are ending up with problems we thought were dispensed with when we 'modernised' our water systems. Resulting problems pertain mainly to the young, the sick and the elderly but, nonetheless, are abhorrent, i.e diarrhoea, headaches, fever, eye, nose, ear and throat

infections etc.

The government's solution to this has been the proposal of installation of long pipes which dispose of sewage farther out to sea, "out of sight, out of mind". One wonders where the logic lies! This is all rather reminiscent of the modernisation of the sewage system in London in the 1840's, after which London had a massive outbreak of cholera.

CONCLUSION

Only in the 20th century have Western civilisations attained standards of toilet design comparable to those of Roman times. The toilet's integration into and re-establishment as part of homes in Europe and America was only successfully achieved in the 1960's.

With the decline of the Roman Empire in 300 A.D., hygiene standards regressed completely. The decline that came about was dramatic and detrimental. It was to take almost one thousand years before any real progress took place by which time the principles of Roman engineering and plumbing had been forgotten.

In the late 18th century, the toilet was invented by Cumming. After this, more inventions and developments of the toilet took place at a rapid pace. Sewers were built, pipes were laid and the plumber came to be regarded as a valuable and indispensable person, such as he had not been regarded since Roman times.

In the 1900's, the pace of development of the toilet slowed down completely. In the 1950's, some stylistic changes took place but no technological developments were applied successfully to improve the toilet's efficiency. In essence, the principle of operation of the toilet is the same as it was in 1900.

Despite the extensive ergonomic research that has been carried out by Alexander Kira in the 1960's, few changes have been made to the toilet to make it a more comfortable place. In fact, digression has been the order of the day. Instead of tackling core problems, designers have circumlocated to camouflage the problems. Camouflaging, however, does not constitute good design nor does it solve any problems.

Toilet design is essentially market controlled and bathroom furniture is not a commodity which people are ready to dispose of or reinstall

according to fashion or whim. The market needs to be made aware of the most correct way of defecation and gradually enticed into accepting new forms of toilets. The traditional East European squat is not the most appropriate answer for Western civilisations, due to currently fashionable clothing used. The best design must thus be a compromise between a squat and a conventional toilet. The seat could be inclined slightly backwards and step provided to rest the feet on. In other words, the posture taken when one sits on a sofa with one's legs dangling over the edge.

To redesign the toilet in terms of ergonomics and styling and have it accepted amongst Western civilisations may require a gradual process. It is, however, time that designers tried to market more strongly new stylistic changes, also improved ergonomics. In terms of technology, it is high time that a new approach is taken to improve hygiene standards, reduce the amount of water used and the decibels of noise produced by flushing.

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GLOSSARY

SYPHONIC FLUSH

As the flush commences air is drawn from the double trap chamber through an aspirator, drawing the bowl contents through the trap as a syphonic flow is induced.

WASHDOWN FLUSH

A volume of water is discharged into the toilet pan which forces the contents through the trap into the soil system.

CLOSE-COUPLED

The cistern is fitted on to the back of the toilet basin. Provides a low height unit and greatly improves the aesthetic appearance.

CISTERNS:

LOW-LEVEL

The cistern is connected to the toilet by a short flush pipe.

HIGH-LEVEL

The cistern is mounted on the wall above head. Common in the early part of the 20th century, still used to avoid obstructions, i.e. windows.

CONCEALED CISTERNS

For use with duct plumbing, these cisterns can be installed on a front or back wall in either high-level or low-level application. Concealed cisterns promote efficient use of space and conceal piping, therefore, aiding cleaning.

BAWBEE

Scottish penny in the 1800's.

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Industrial Chemicals Division

Miss M.Corcoran,
National College of Art and Design,
100 Thomas Street,
Dublin 8.

DH/rd

2nd November 1989

Dear Miss Corcoran,

Thank you for your letter of 27th of October 1989 requesting information on the development of bathroom furniture throughout the ages.

Unfortunately we have no involvement in such area of domestic technology and therefore cannot be of assistance to you.

We wish to well with your project knowing that the invention of the S-Bend must figure as one of the major milestones in human history, along with the wheel, gun-powder, powered flight and antibiotics.

We remain,

Yours sincerely,

D. Hegarty

D. HEGARTY
TECHNICAL MANAGER

The toilet in Edith Bertha Crapper's house. Miss Crapper is the niece of the legendary and controversial Thomas Crapper.