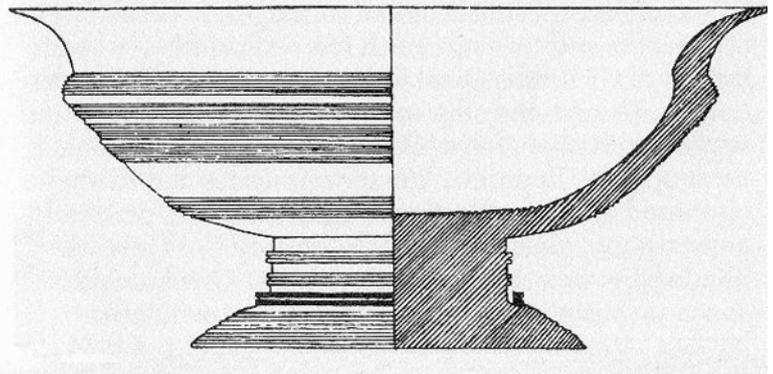
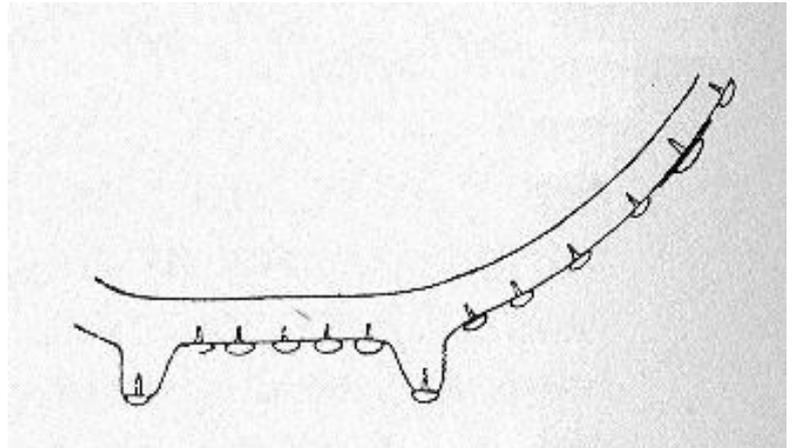
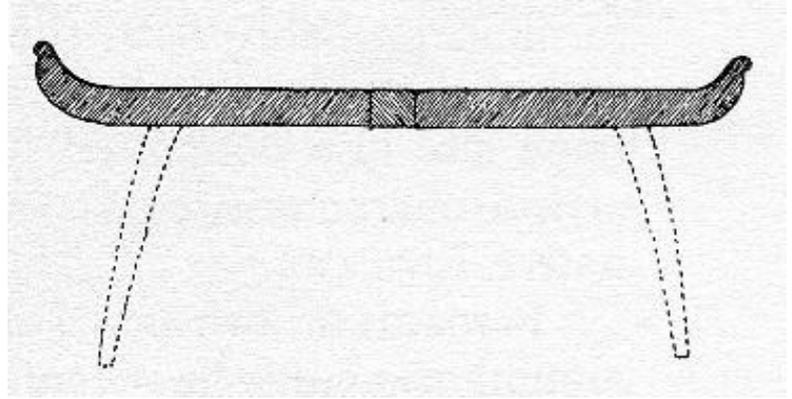


# A SHORT HISTORY OF TURNING

by John Edwards

The craft of turning has provided useful and decorative articles for well over two thousand years. Its history began when man first constructed a rigid frame supporting bearings on which a workpiece could be rotated on a spindle and cut to a circular form with a hand-held tool. It is not known when this method was first discovered but a shallow bowl made c.1200 BC and found in a grave at *Mycenae* is believed to have been turned. The oldest indisputable example of the turner's art so far discovered is a fragment of an Etruscan wooden bowl, made c.700 BC and found in the *Tomb of the Warrior at Cornetto*. Beautiful and elaborately turned wooden bowls, beads and other ornaments in amber have been found in sufficient numbers to prove that by the 6th Century BC highly skilled turners worked among the Etruscan and Celtic peoples.

A magnificent turned wooden bowl of this period was discovered at *Uffing in Upper Bavaria*. By the 2nd and 3rd centuries B.C. the use of the lathe was known throughout Europe and the Near East and the range of lathe-turned products had been increased to include spokes and hubs for wagon wheels. The first known example of a workpiece turned between centres was an unfinished wheel hub with spindles (deadheads) found at the site of *Glastonbury Lake Village* (100

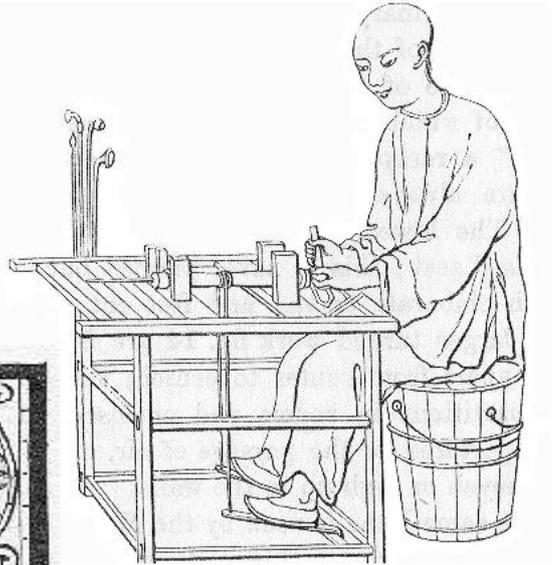


BC – AD 50). Bracelet rings turned from soft stone were also found at this site.

Early turners from the East sat on the ground at their primitive lathes, using one hand to drive the spindle with a bow while the other hand held the handle of the turning chisel: they used one foot to hold the lathe steady and to act as a tool-rest while the toes of the other foot were used to guide the point of the cutting tool. Such primitive lathes can still be seen in use today in the bazaars of the Near East and Asia.

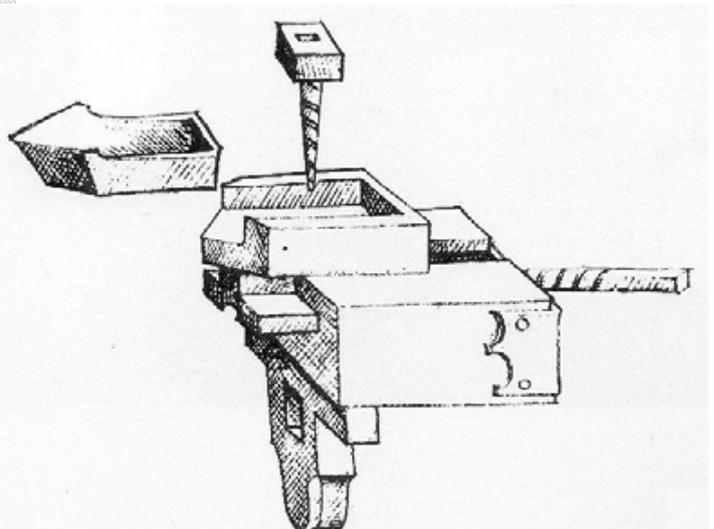
In China the turner sat at the lathe and used his feet to make the reciprocating motion by pedalling alternate left and right foot-boards attached to a cord wrapped around the lathe spindle; thus leaving both hands free to hold and guide the cutting tool. Western turners, preferring to stand at their lathes, developed the pole lathe whereby only one foot was needed for the reciprocating motion.

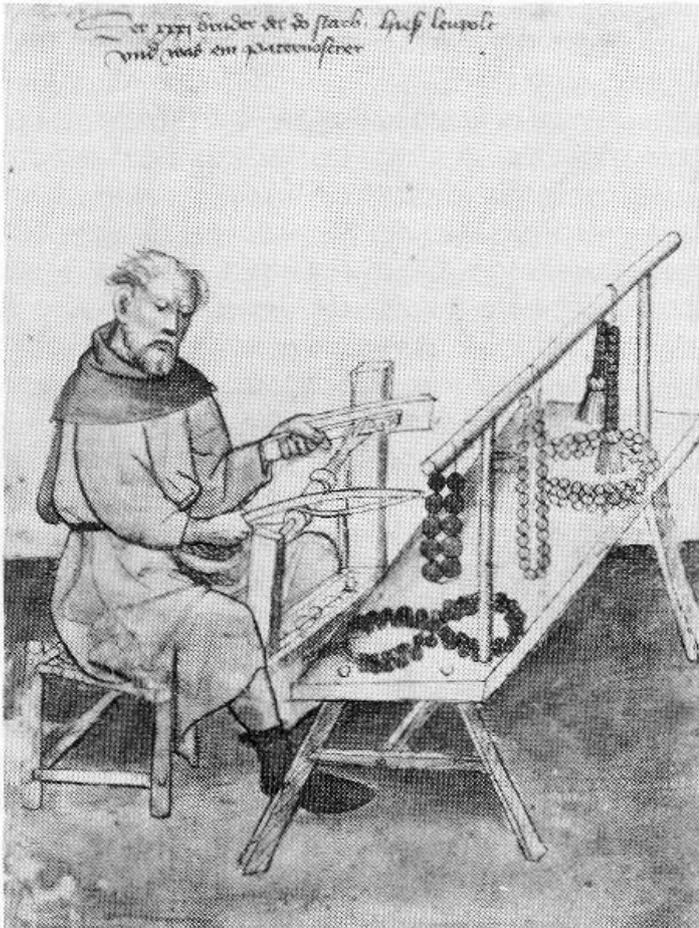
The first known illustration of the



pole lathe appeared in a 13th century stained glass window at Chartres given by turners of the local guild in honour of their patron Saint Julien.

The next improvement, seen here in an illustration from *Mendelsches Bruderbuch 1395*, shows the lathe frame and stocks made from heavy timbers to improve rigidity. The difficulty of holding the cutting tool steady when cutting very hard or variable materials gave rise to the major invention of the slide-rest in which the tool is held firmly and advanced into cut by a slide under the control of a screw. This illustration from the *Mittelalterliche Hausbuch* of 1480 shows a very early form.

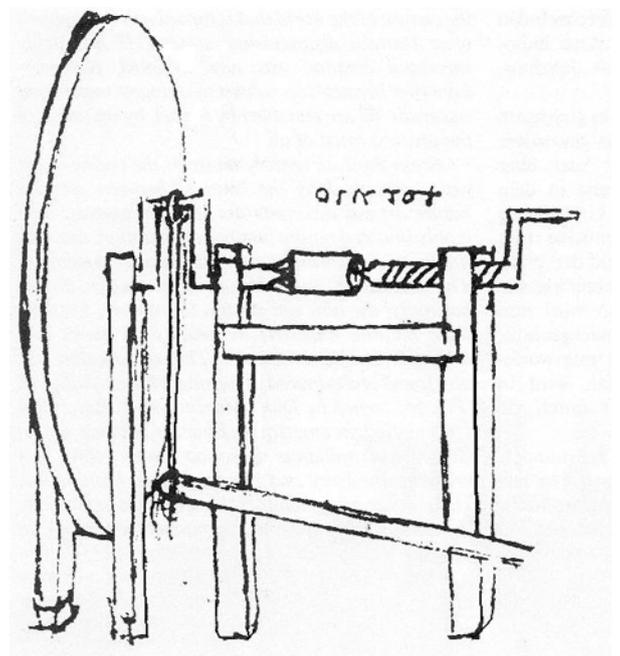
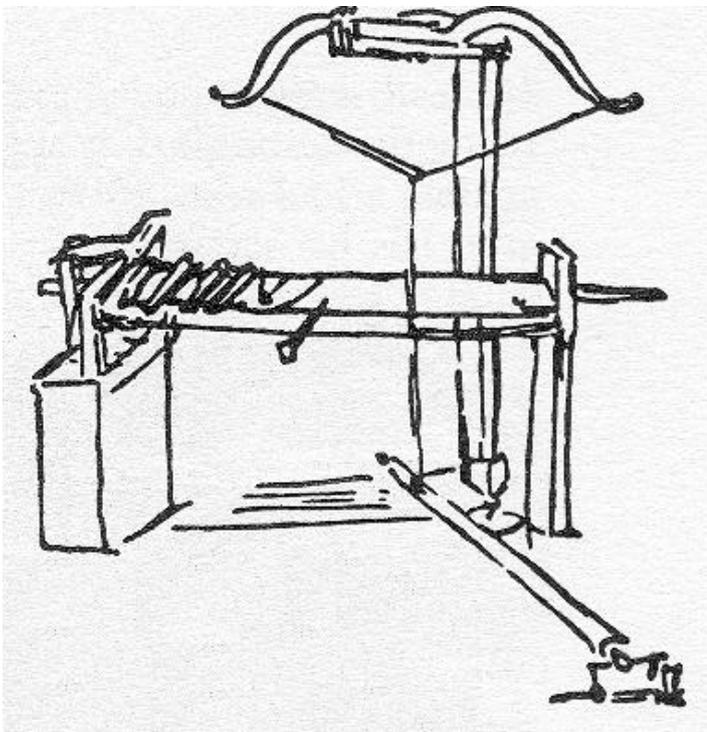


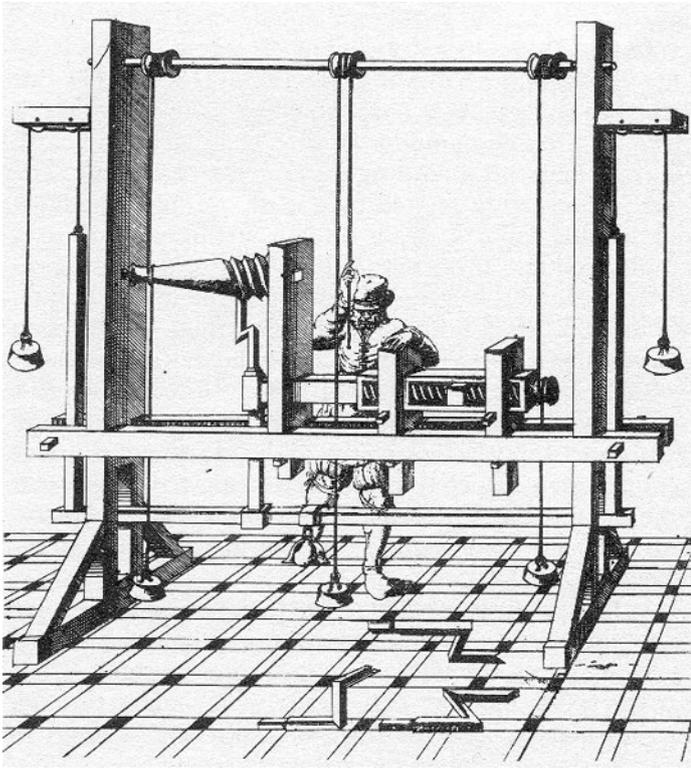


From early medieval times the authorities of European cities required that important crafts within their walls should be governed by the establishment of trade guilds to organise apprenticeship and welfare schemes, attendance by members at trade fairs and, most importantly, to exercise control over the standard of members' work. In return the Guilds were granted the privilege of protection against competition from non-guild sources. No person could practice a trade or sell goods at a fair unless as a freeman of the appropriate guild. The Turners Guild of London was well established in the early part of the 14th century and they were required to provide wooden vessels of accurate and consistent volume for the measurement of liquid and dry commodities. From 1347 each turner was required to have a registered mark by which the authorities could identify the maker of any vessel. The Turners Guild received its Royal Warrant from King James 1st in 1604, becoming a 'Worshipful Company', the 51st in order of precedence.

Some of the most important inventions of the 15th century are depicted in *Leonardo da Vinci's 'Codice Atlantico' (c.1500)* and they include:-

- the first floating mandrel for screw-cutting;
- a longbow in place of the traditional pole thus taking up less floor space;
- a cranked flywheel that had the tremendous advantage of continuous rotation providing constant speed and thus improved control over the cutting tool; this illustration is also the first to show:-
- a drive between two bearings of the headstock and
- a tailstock with screw adjustment to turn workpieces of different lengths between centres.





Jacques Besson, Leonardo's successor as engineer to the French court, was also interested in lathe development and brought some of these ideas into practical reality by building a screw-cutting lathe and two ornamental turning lathes, the latter used sliding mandrels with templates and cams to produce intricate shapes.

These illustrations are from Besson's book *"Theatre des Instrumens Mathematiques et Mecanique"* (1578).

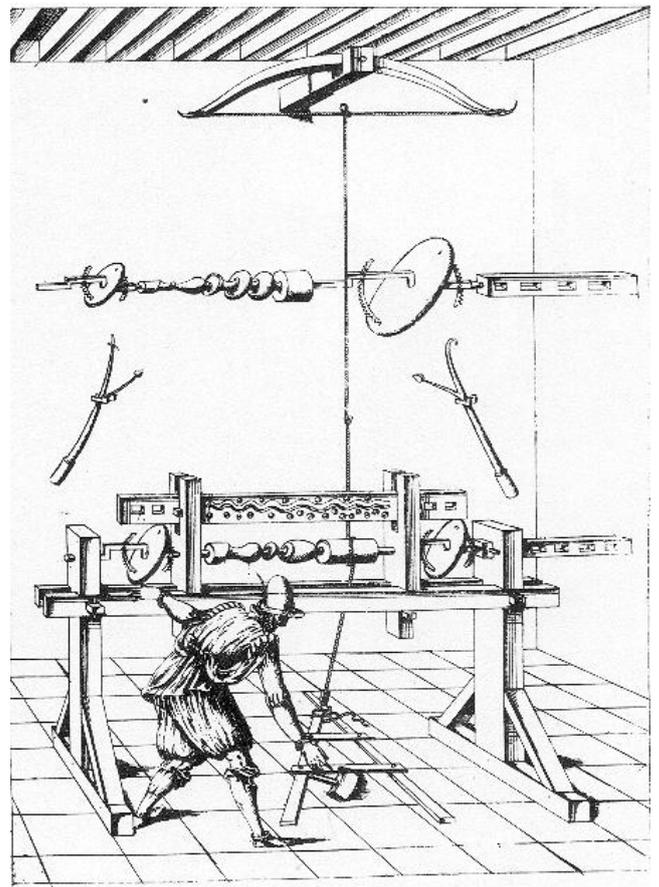
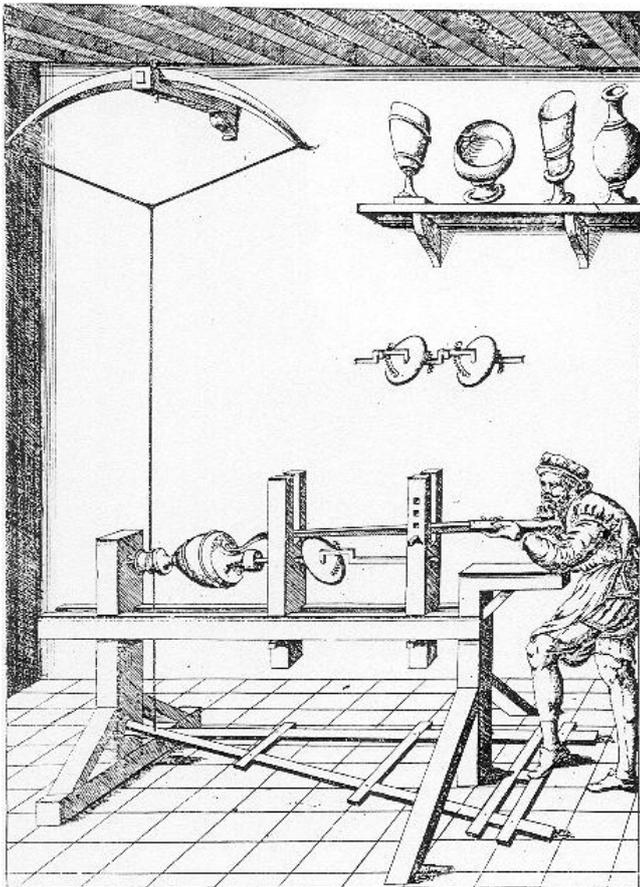
In 1615 Salomon de Caus, engineer to Henry,

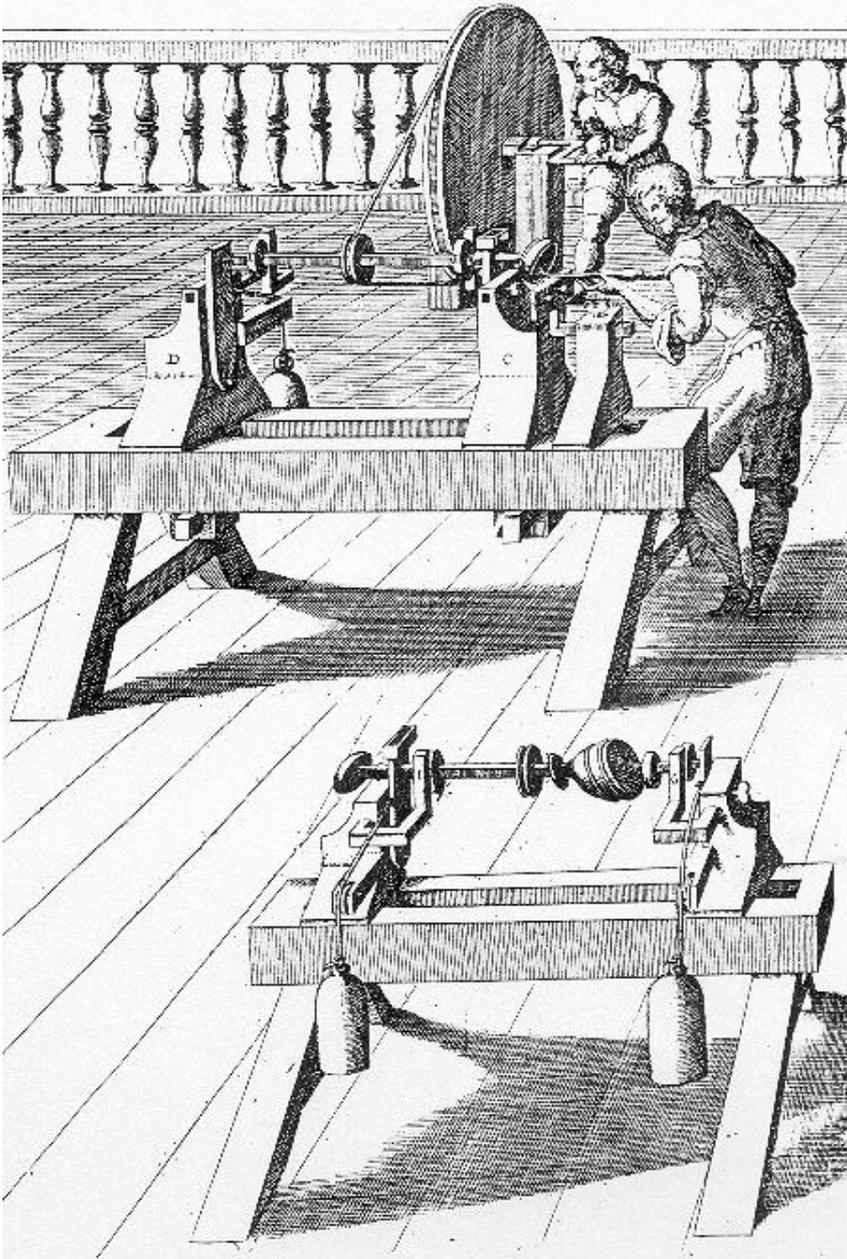
Prince of Wales, and later to Charles 1st, depicted an Eccentric Lathe for turning ovals which showed for the first time a lathe spindle that could be rocked under the control of eccentric cams against the pressure of weighted cords. This is an early illustration of the principle of the rose engine lathe.

So, by 1500 all the main elements of the modern lathe had been invented and by 1615 many basic features of the ornamental and automatic copying lathes which would later be adapted in the development of industrial machine tools.

However, great concern arose, especially among the Turners Guilds, that these inventions could put their members out of business and they made rules prohibiting the use of new methods; they even destroyed the machines in an attempt to protect their trade. As a further protection the mysteries of the craft were closely guarded by the master turners and although the subject is mentioned in various manuscripts, dating from Virgil in 37 BC to Jacques Besson in 1569, there were no written works giving a detailed explanation of turning until Joseph Moxon published in 1678 the first English book, *"Mechanick Exercises"*, which describes the main tools and basic techniques.

In 1701 Charles Plumier, a French cleric of extraordinary abilities, published his *"L'Art du Tourner"*, the first work to explain in comprehensive detail the known technology of turning at that time. His authority as a churchman and the fact that he did not

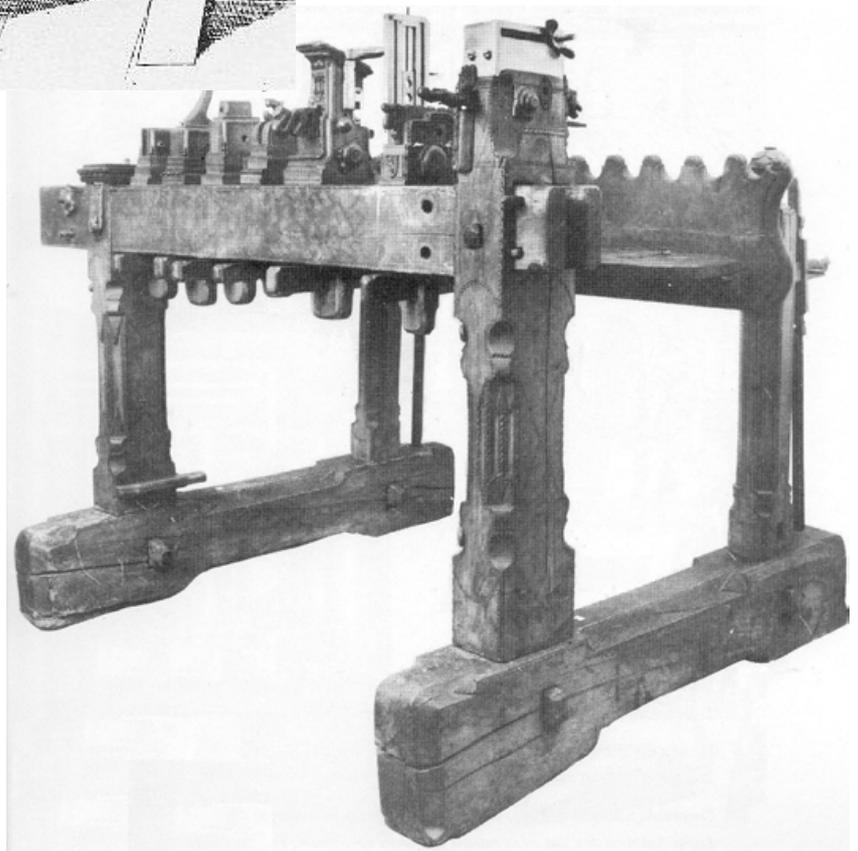




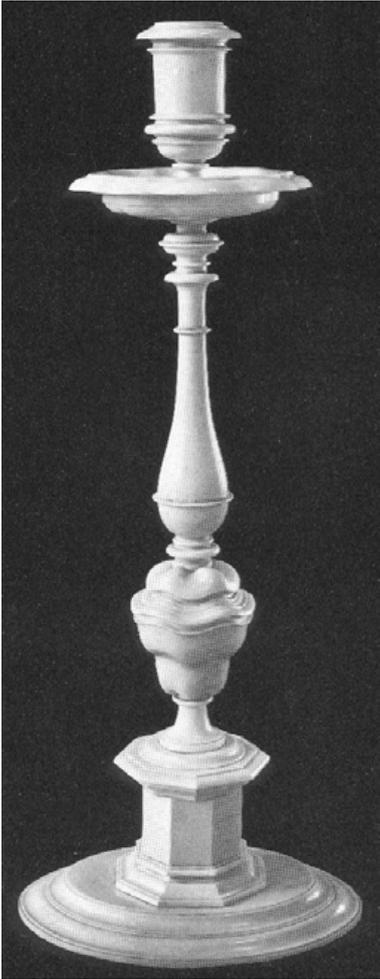
represent competition for their livelihood, probably caused the master turners to confide in Plumier more secrets of their art than they would to any other person.

Much of Plumier's work is devoted to the machines and methods of complex or ornamental turning, a hobby of Kings and wealthy amateur turners throughout Europe since the late 15th century.

Probably the earliest lathe still in existence is that of *Emperor Maximilian I of Austria*, made c.1500-18. During the 16th and 17th centuries in these royal workshops were made some of the most complex turning the world has seen.



Here are some examples:

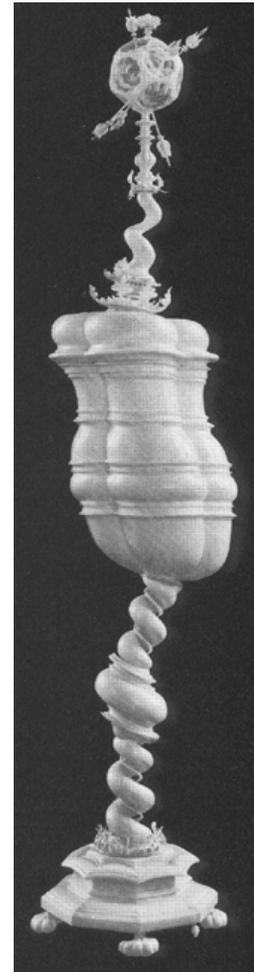


*Elegant ivory candlestick made by Duke Maximilian of Bavaria 1608.*

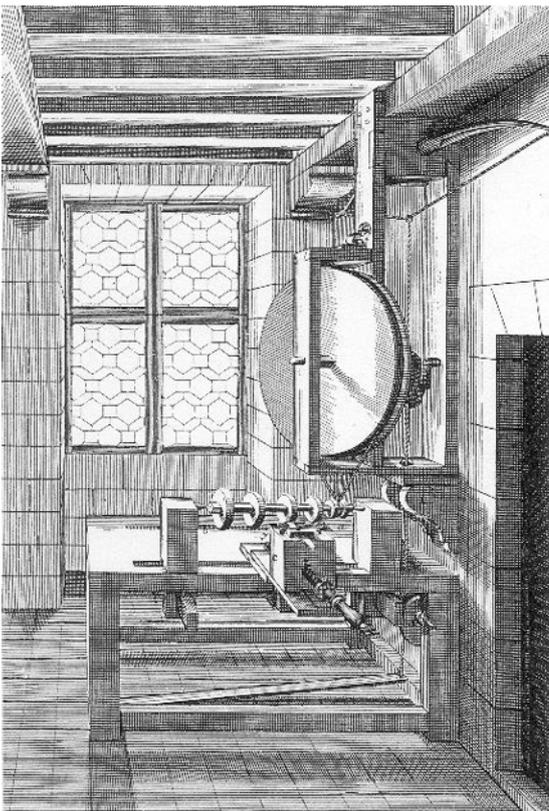


Grotesque but undoubted masterpieces of the turner's art

*Marcus Heiden  
Coburg 1626.*



*German  
17th century.*



The royal families of Europe vied with each other in the excellence of their workshops. One of the keenest turners was Peter the Great of Russia who employed experts from all over Europe. A.K.Nartov, an engineer of great genius constructed for Peter some of the most complex rose engine and portrait copying lathes in the world.

Many of the inventions of the ornamental turners were to re-appear later when they were adapted for industrial purposes; e.g. the lathes for screw-cutting, copying, oval-turning, ball-turning, rose-engine turning, line-engraving and security printing. Old methods continued side by side with the new: the pole lathe and its longbow-driven variant were in common use until 1800 and pole lathes are still used by some woodland turners to the present day. For heavy turning the *Great Wheel*, driven by an assistant, was in common use by the mid-16th century but the end of the century saw the introduction of the horse engine and then the water wheel, providing greater power and speed and thus increasing the scope of this basic machine tool.

By the late 17<sup>th</sup> century the most advanced machines had conical spindle bearings to support the end-thrust of face-plate turning and also overhead shafts with pulleys of various sizes to give different driving speeds. By 1710 Polheim of Sweden had applied water power to the controlled driving of the cutting tool relative to the workpiece; thus making possible the cutting of steel with greater than manual force.

By 1771 the facility of quick and accurate adjustment to the cutting tool was provided by the compound slide-rest with adjustable gibs as evidenced by these engravings from *Diderot*.

Small lathes constructed entirely of metal were introduced in the 18th century in the clock and instrument making trades for the production of small precision parts and instruments in iron and steel.

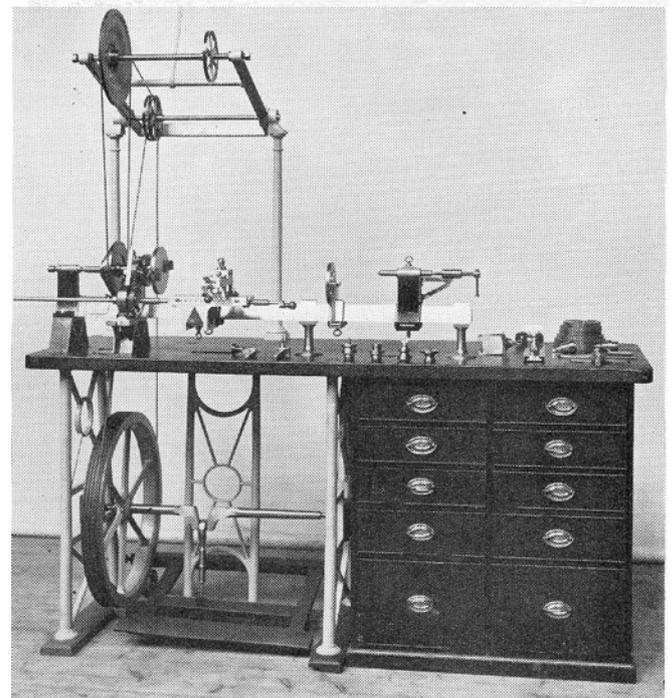
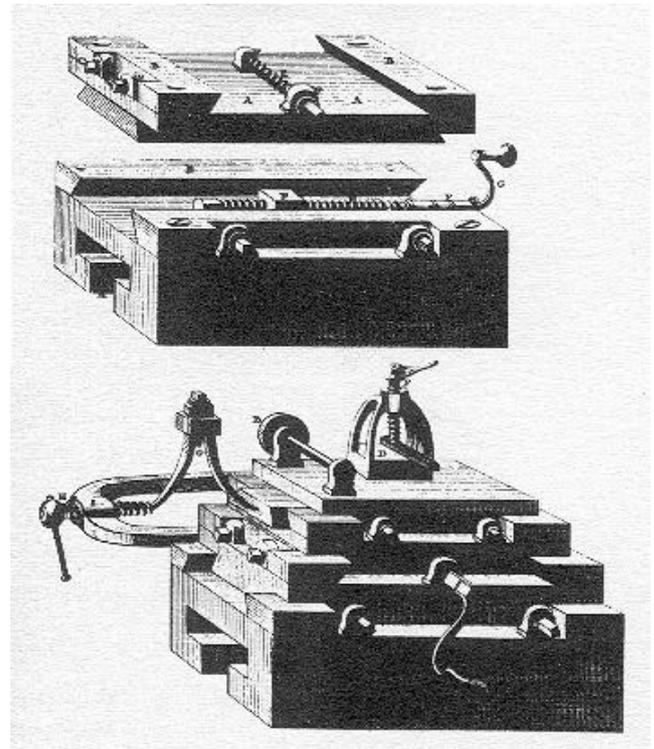
The industrial importance of the lathe for metalwork became widely recognised around 1800 with Henry Maudslay's inventions. His lathes were the first to produce precision machine parts in iron and steel in industrial sizes and quantities. *Here is a bench lathe made by Maudslay c.1810.*

By 1850 British lathes were to be found in every industrial country of the world. However, the lead in this technology was soon to be taken by America, then by Germany and, in the post-war industrial revolution of computer controlled machine tools, Japan has joined the leaders.

The craft of turning is, in its modern applications so much a part of the engineering and furniture manufacturing industries that it is no longer possible to isolate it as a separate technique. However, in Britain as elsewhere in the world, woodturning is enjoying a welcome rebirth as a popular artistic hobby and even as a livelihood for the most successful practitioners. Craft fairs now abound where distinctive articles turned from wood are once again in demand; although the work of only the most well-regarded turners commands high prices.

The London Trade Guilds flourished until the 18th century when many were slow to respond to the pressures of change and their influence declined. To maintain their existence many guilds accepted members who were not of the craft. In 1850 some new members of the Turners Company, although not themselves turners, decided that they had a responsibility to support and protect the craft. To this end they held competitions for turners throughout the Kingdom, exhibited and judged at the Mansion House and reported in the press. This programme was curtailed at the start of World War II but has been revived in recent years with competitions arranged by the Worshipful Company of Turners and held at Apothecaries Hall and, more recently, at Carpenters' Hall in the City of London.

(c) John Edwards 23/08/2001



#### Sources:

- Abell, Leggatt & Ogden "A Bibliography of the Art of Turning and Lathe and Machine Tool History"
- J. Besson "Theatre des Instrumens Mathematiques et Mecanique"
- R. Champness "The Worshipful Company of Turners of London"
- V. V. Danilevskii "A.K. Nartov and his Theatrum Machinarum"
- M. Cobb "The Register of Professional Turners"
- K R Gilbert "Machine Tools a catalogue of the Science Museum collection"
- J. J. Holtzapffel "Turning and Mechanical Manipulation"
- K. Maurice "Sovereigns as Turners"
- C. Plumier "L'Art du Tourneur"
- L.T.C. Rolt "Tools for the Job"