LATHE WORK

The lathe is a wonderful tool, in fact without it the Industrial Revolution would never have happened. It does however need a bit of familiarity and practice in order to get some decent results out of it. It has to be said that most texts on lathe work relate to larger items of turning and are not applicable to our small modelling; hopefully these notes might be of use in addressing this.

Newcomers to the lathe might be a bit intimidated by it and by the fact you have to get up close and personal with an item which has unguarded chunks of metal flying round at many thousand RPM. But fear not, compared to other items of workshop machinery which can bite, get your hand too close to the chuck and it will knock your hand away without damage. There are however basic safety rules which must be observed so please:-

1) Never ever leave the chuck key in the chuck (the lathe operators golden rule). After using the key immediately put it back on the bench outside the work area, don't take your hand off the key while it is still in the chuck.

2) Wear close fitting clothing, no ties, scarves or floppy jumpers.

3) Take off any jewellery, especially any medallions on chains (Elvis models O.K.) also bracelets and chunky rings.

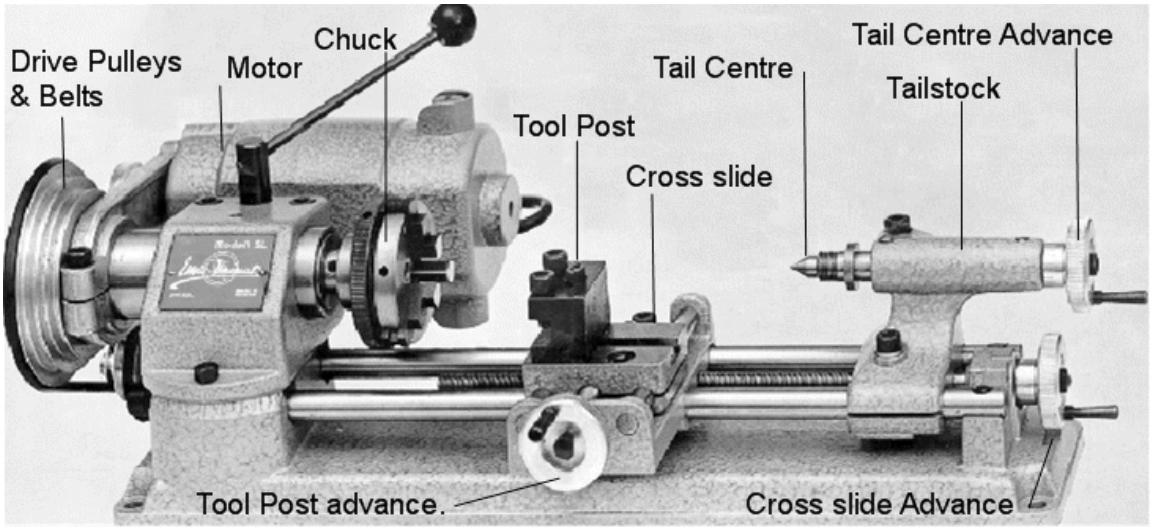
4) Long hair? Tie it back well out of the way.

5) If you buy a second hand lathe check the cable and switch condition and especially the electrical earth.

6) Buy a pair of large lens supermarket / drugstore magnifying reading glasses something like 2.5-3 magnification, they will allow you to keep a bit further away from the work piece and give eye protection. Don't go too strong they tend to disorientate and distort.

7) Keep your mind on what you are doing and if someone interrupts you stop.

Elements of the Lathe



Lathe shown is original Unimat SL(DB)

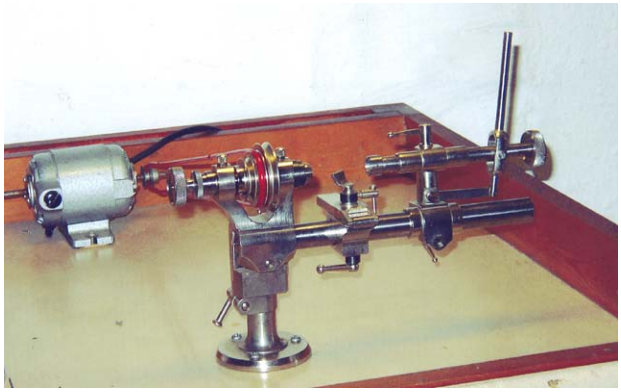
Chuck. To hold the work piece. Can be replaced with a Jacobs chuck or centre for alternative work holding
Tailstock. To hold and locate the Tail centre, can be unlocked and slid towards the chuck
Tail centre. To hold the end of long pieces of work. (Small lengths can just be held in the chuck). Centre can be removed and replaced with Jacobs chuck and drill and the advance wheel rotated to drill the work.
Tool post. To hold the cutting tool in a precise location
Cross slide. Runs on the bed rails and has a mounting for the tool post which can be driven forward by the tool post advance wheel to bring the cutting tool on to the work piece.
Cross slide advance. This moves the cross slide and tool post sideways and hence the cutting tool towards and away from the chuck.
Drive pulleys and belts. By varying the belt position on the pulleys various speeds of chuck rotation can be achieved.

Choices of Machines.

For the purposes of this text I have categorised machines into three groups in the manner they are often referred to on the web.

a) Jewellers or watchmakers lathes
b) Hobby lathes.
c) Model maker's lathes.

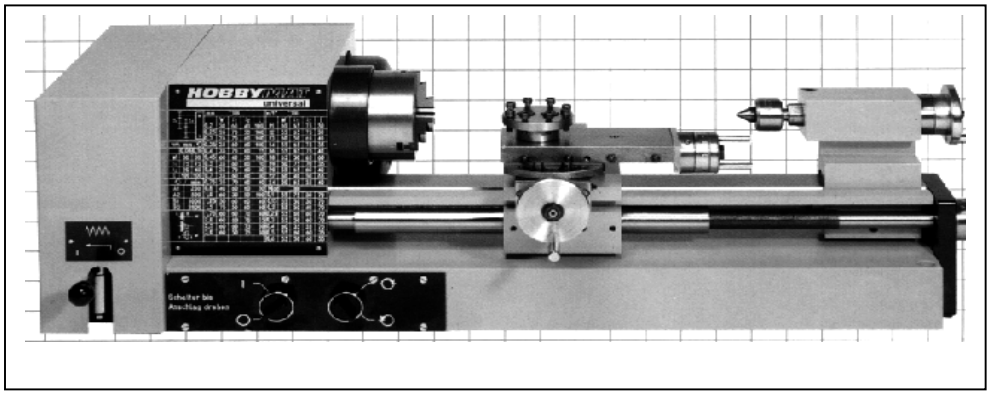
a) Jewellers or watchmakers lathes as the name suggests are very small machines often of a skeletal pattern and with a separate motor. They are masterpieces of precision engineering and capable of turning the smallest of watch cogs and wheels. They do not usually have chucks but use collets to hold the work; these limit the diameter of work they handle. For anyone who wishes to turn very small items (say up to 6mm) they would be ideal. However due to the high quality of the machine a good one will come at a high price. They are often listed on eBay, approx price from £350. The machine below had a price tag of £800



b) Hobby lathes are larger machines than jewellers, Still small (can be lifted onto the bench with one hand). These are the most likely machine that we would be considering to own. They are still limited in size but typically able to turn up to 2.5 / 3" dia and up to 9"in length. They are still precision machines and in good order and hands capable of turning to .001" accuracy or less although due to their size and price they may have limited facilities. Some models though have the facility of attaching accessories for vertical milling sawing and sanding. Some machines also have bored spindles which allow longer lengths of turning to be slid inside increasing their capacity. In my personal opinion however the capacity to accommodate masts of some length should not be a main factor in deciding the specification of a machine purchase, it will greatly restrict choice and masts and spars can quite well be spun up by other means. Quite a variety of machines are available, new; second hand and antique-collectable, some have avid enthusiast groups and web sites.

As a general rule when buying a used machine, condition is everything. Machines are offered which are “as new” and obviously hardly used. At the other end of the spectrum there are ones which have been abused, damaged by using them for tasks beyond there design and capability and stored for years in a damp shed. Avoid these; they are not a bargain at any price.

c) Model makers lathes are machines larger still. “Model Makers” is here defined as builders of model machines, steam and traction engines etc. who need the advanced facilities of screw cutting, boring and turning diameters up to 4/5”. At this size the lathes are heavy, a two man lift and need a strong bench or stand. They can still produce small size turnings but someone going for one of these is probably upgrading from a smaller machine and knows what he wants, The machine illustrated below is a German made Hobbymat, such machines sell new for £450 to £600 depending on specification.



Various Hobby Lathes Available

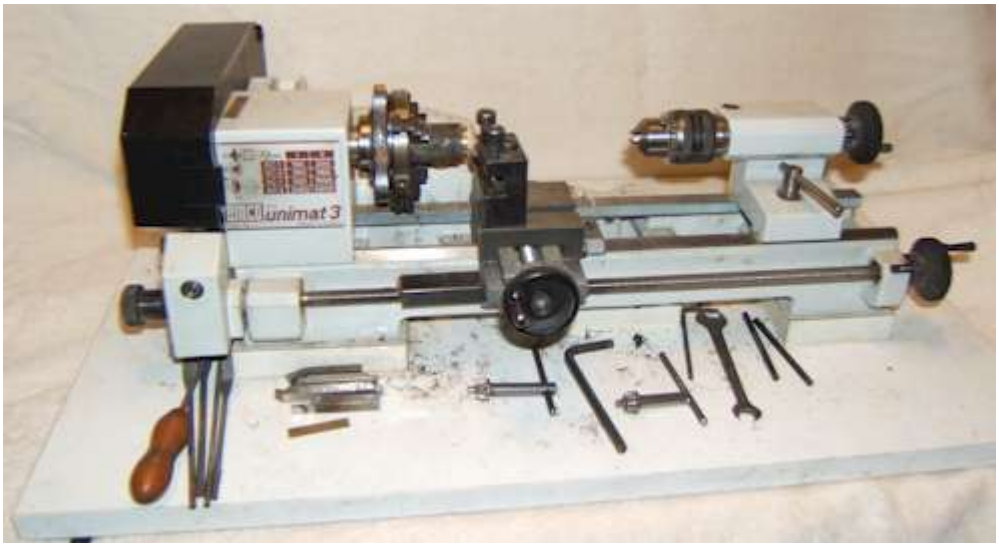
Unimat SL (DB) For illustration see *Elements of the Lathe* section.

The original Unimat, a brilliant little machine. Built in Austria and originally marketed 50 years ago it sold in thousands and most machines are still doing sterling service and beloved by their owners. Not just a lathe but a comprehensive work centre as attachments could adapt it for vertical milling, bench sawing , jig sawing, sanding, grinding and more. The headstock of the lathe can be swivelled so that taper turning can be carried out without needing a taper turning cross slide. Spare parts are still available from Blue Ridge Tools in the USA. www.blueridgemachinery.com.

Unimat SL`s (DB in the States) often come up for sale on eBay and a good one will sell for around £200, more if the lot includes a good selection of attachments.
Spec.

Swing over bed 1.5" (3"dia)
Between centres 6.75"
Speed 350-6000 rpm>

Unimat 3.



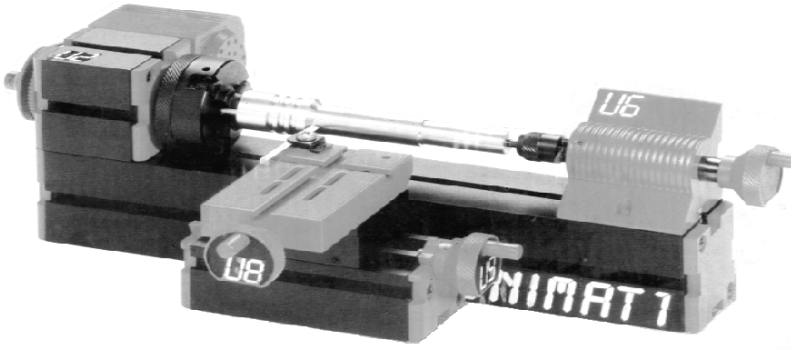
The Unimat SL`s successor. A very solid well made little lathe, considered by many to be the best little lathe around.
Straightforward in design and with the capacity to be adapted to vertical milling.
No longer in production but well served by aftermarket suppliers to cater for its large fan base. Occasionally these turn up on eBay, good ones sell for £300 +. Unfortunately entrepreneurs buy them, strip them apart and sell the parts back on eBay to make more profit. Built in Austria, after its demise in 1996 it was replaced by a Taiwanese clone the Unimat 4, which was not well made and not liked, this has now been remanufactured and sells as the MJ358
Spec

Swing over bed 1.8" (3.6" dia)
Between centres 7.8"
Speed 130 – 4000 rpm

MJ358

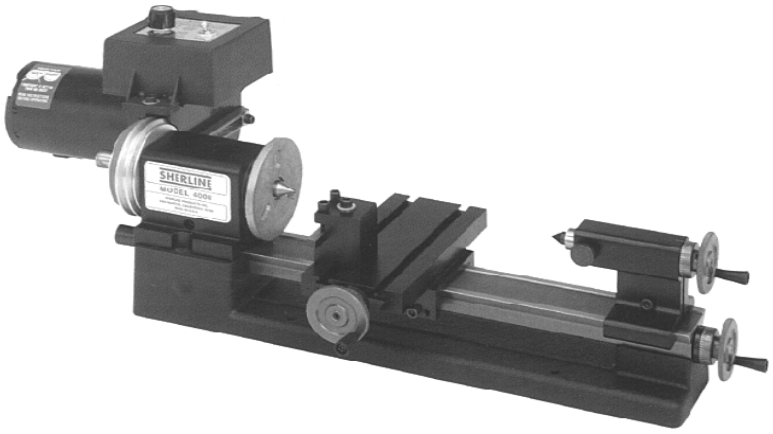
As above this clone of the old Unimat 4 has found certain favor from its price of £279 and the fact it is now reasonably engineered and can accept the accessories which are marketed for the Unimat 3.
It is marketed also in Australia by Minitech www.minitech.com.au and In the UK by Chronos. www.chronos.co.uk

Unimat 1 and Classic.



A strange animal this coming as it does from Unimat! The bed rail is thin aluminum, the optional chuck is white metal the rest is all plastic and it has a 12 volt motor. The best I have heard about it is that it is quite good at machining wax.

Sherline Lathe.

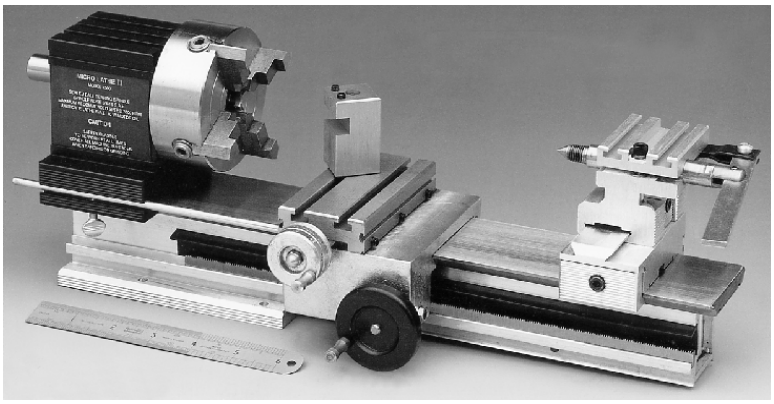


A very popular lathe manufactured in the USA www.sherline.com although originally designed and made in Australia in 1970. Spare parts readily available as is a large range of accessories. A very large enthusiastic fan base.
The machine has a very good reputation for quality and reliability. The motor is variable speed through an electronic controller. The motor and headstock can be swiveled a small amount to allow taper turning, enough for production of canons. The motor drive is through two step pulleys giving a high and low range of speeds. The spindle can be driven by hand if required, primarily for screw cutting but this is also useful for delicate pieces. A long bed version is available for those wishing to turn masts and spars The bare lathe price is $575 and $675 for the long bed version.
Among the aftermarket accessories the Sherline is blessed by having available a dedicated replicator tool. Just the thing for making 100 canons for a first rate.

Spec.

Swing over bed 3.5”
Between centers 8” (17” on long bed model)
Speed 70 – 2800 rpm

Taig Lathe (Peatol in the UK)



Another very popular lathe made in the USA. www.taigtools.com A very rugged little machine. What sets this one apart is that the motor is an option you can therefore put your own motor with it, however the option motor is a whacking great 1021 watt unit. Compare this with the 100 watt of the little Unimat SL. No burnt out motor problems with this one. The price is good at $436.45 for a machine complete with 3 jaw chuck, boring bar, tailstock, Jacobs drill chuck, motor and mount, mounting board and pulleys.

Spec.

Max. turning dia. 4.5”
Between centers 9.75”
Speed 525 – 5200 rpm

Axminster Sieg.

SIEG C0 SIEG C1

Both these lathes are made in China and sold around the world under retailers own names and in various colour schemes. In this case by Axminster Tools of the UK www.axminster.co.uk .

The model CO has
- Swing over bed 110mm
- Between centers 125mm
- Cost typically £150

The model C1 has
- Swing over bed 140mm
- Between center
- Cost typically £230

A well made pair of machines . The CI is built around a substantial cast iron hardened and ground bed. Powered by a 150watt motor through a variable speed control giving speeds of 100-3850 rpm. Machine weighs 13Kg and has an interlocked chuck guard for safety. Spindle is threaded 14mm allowing fitting of other chucks and has a 10mm bored center

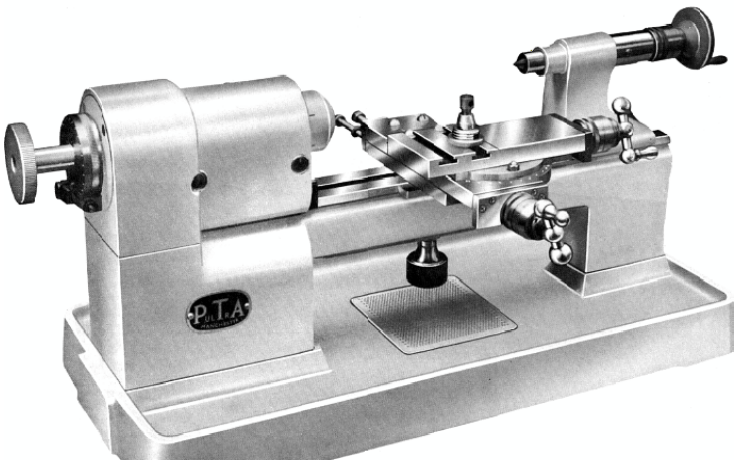
Machine Condition

Spend a little time ensuring your lathe is I good order. Tolerate no rust on any part. If there is any remove it with 000 grade steel wool lubricated with light machine oil.

Take the chuck apart, remove the jaws and clean all parts. Note that with the 3 jaw self centring chuck each chuck slot and the jaw is stamped with a corresponding number 1-2-3. The jaws can be installed either with the projecting jaw innermost to hold small items or outermost to hold larger pieces. When installing the jaws to the former they are inserted in the sequence 1-2-3, when to the latter the sequence is 3-2-1. Similarly clean and oil the cross slide and tailstock and ensure they move freely.

Most important of all clean grease and adjust the head bearings. They should spin freely without any end play or runout (side movement). Refer to the instruction manual on how to do this. Fit a length of bar in the chuck and check that you can feel no sideways movement when pressing side to side on the bar.

If you do not have any manual visit www.lathes.co.uk and follow the link on the home page for you make of machine.

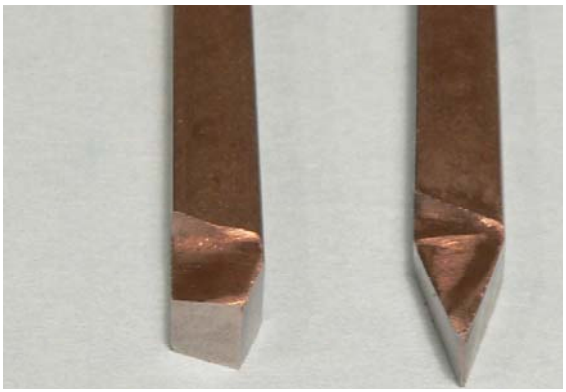


Operating

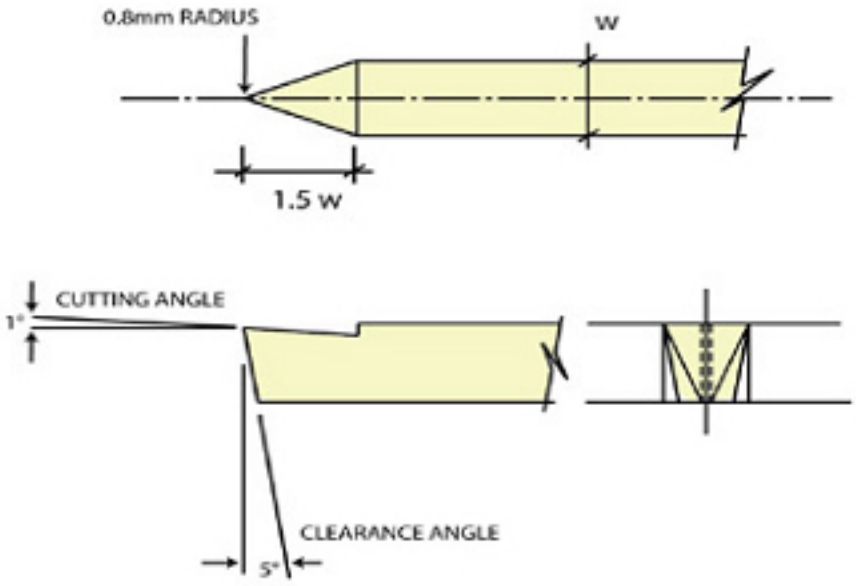
Note that some smaller lathes have quite small motors and it is best not to flog them. The Unimat SL for instance has a motor rated (not continuously) but at 80%, this means 8mins on load and 2mins cooling.

Now, give yourself the maximum advantage and ensure your tools are sharp. When turning small items like spindles a blunt tool will just push the piece away rather than cut. A small fine grinding wheel with arbour can be mounted in the lathe to sharpen the tool, but I suggest you practice on an old one or a dead drill first to get the feel of it. Place newspaper under the wheel to stop hot grit welding to the bed rail.

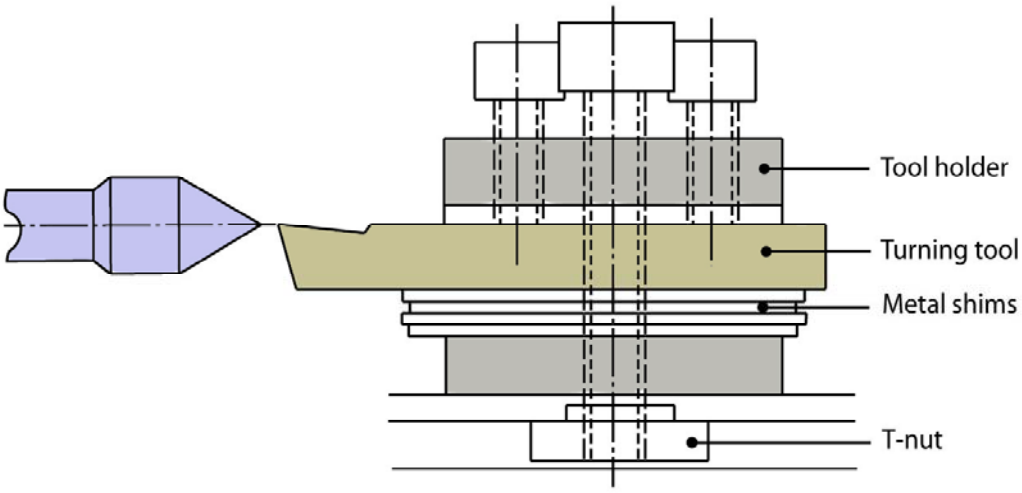
You will need a right turning tool for taking down the side cuts on canon and a pointed or planning tool for most else although I find a round nosed tool similar to the planing tool but with a 3mm radius nose useful for turning the cascabell of canon.



Shown here are the right hand planing or turning tool and the pointed turning tool.
They are made from HSS steel.
Turning tools are available with tungsten steel tips and ceramic inserts but I have not found any small or delicate enough for our work.



These are the grinding angles I use on my tools. Textbooks say that for brass the cutting angle should be nil, but I have about 1degree and find that with this I can use the same tools for hardwood and for brass. After grinding I do give the tools a bit of a polish to the cutting faces on an India oil stone



When turning small diameters it is essential to ensure the tool tip is exactly on the centre line of the work. Adjust this by adding or removing shims from below the tool.

Finally in this section, turning speeds. No need to stick dogmatically to these, but recommended:-

Mild Steel.	1100rpm.
Brass	2000rpm
Hardwood	1600rpm

For mild steel a little paraffin brushed on will act as a lubricant and coolant, brass needs very little, a little spittle will suffice