The C3 Mini Lathe 1

Dave Fenner takes a look at smaller scale working

This is the first of a series of articles based on the C3 Mini Lathe, commencing with description, strip down and rebuild. Later articles will look at the range of accessories available and their application and then move on to consider modifications and home built accessories.

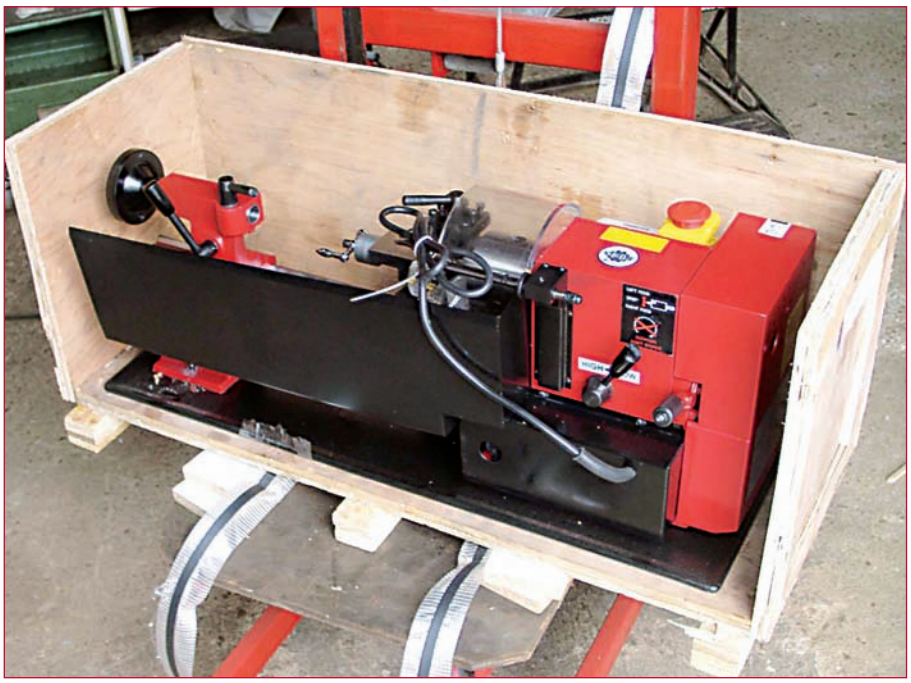
Background and description

The version of the Mini Lathe discussed here is the one offered by Arc Euro Trade, who kindly made the machine available for assessment. Similar machines are offered by other suppliers such as Chester, Chronos, Machine Mart, Warco etc. and although there may be detail differences, they are substantially the same machine.

The detail differences usually relate to variations in motor power, length of bed, tailstock clamping mode, spindle tachometer, and DRO hand wheels. Manufactured in China, it has been available for a number of years and with the passage of time, the specification and range of accessories has improved in response to customer feedback.

Arc offer machines either "Factory assembled" or "ARC prepared". The latter costs a little more but for the extra money, they strip, clean, and adjust the machine, so that on receipt it is ready for immediate use. The machine in this case is "Factory assembled", so the preparation exercise, generally based on what is done by Arc will form the essence of this article. They are now planning a picture story book which will be published on their website in due course.

The catalogue description quotes: swing over bed 180mm and distance between centres 350mm or 13.78in. The swing figure is diameter rather than radius so the centre height would be 90mm or 3.54in. The spindle is bored through 20mm diameter, and carries a MT3 taper, the tailstock being MT2. The 80mm three-jaw chuck is retained by three bolts and is bored through 16mm, while the optional 100mm four-jaw chuck has a 22mm bore.



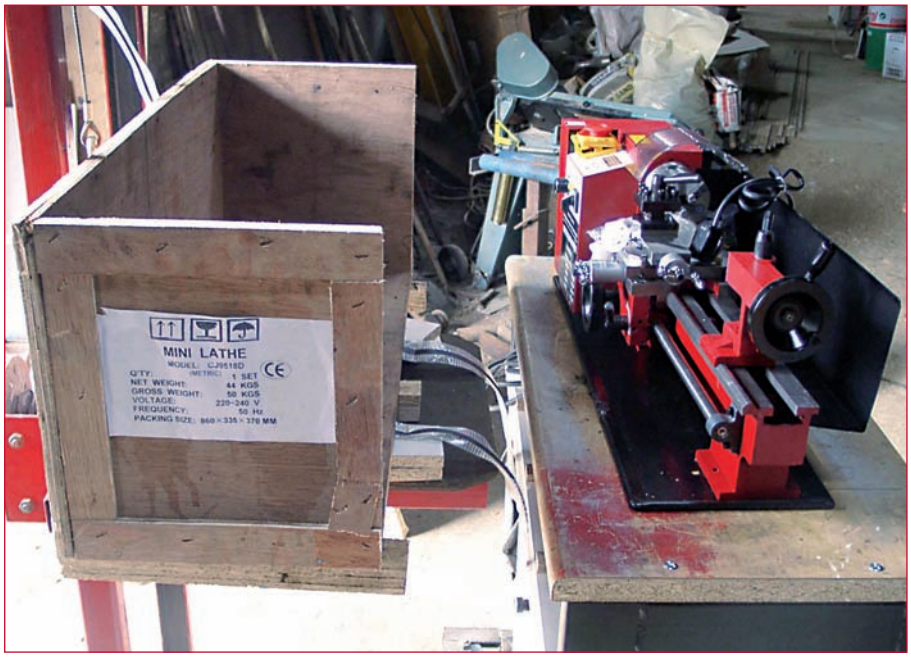
1 Top and one side of packing case removed.

Power comes from a 350 watt (Approx ½hp) D.C. motor with a continuously variable speed. A two speed gear system gives a claimed total range of 100 to 3000 rpm.

Over the years, the Myford Series Seven has become almost the standard model engineer's lathe, so some comparisons are inevitable. The swing over bed is a few thou larger, but there is no bed gap. The length between centres is shorter (standard Myford is 19in.); spindle bore and taper are greater than the Myford which is 15.08mm and MT2. Weight is less at 44Kg compared to the older S7 at 111Kg.

Notably, the cross slide is relatively short. This with the associated make up places a restriction on the radial movement available at the toolpost. Pricewise, a brand new Mini lathe will set you back around £300, or with accessories about £500 and for the same money you might be lucky to get a well worn ML7. Looking at the small footprint and fairly low weight, this might well be a machine that could be tucked away in a corner of a spare bedroom rather than a draughty workshop. My guess is that it will appeal to newcomers to the hobby making a first purchase, and to those working in a small scale or on small components.

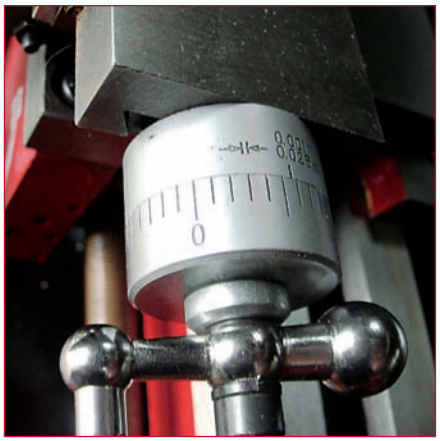
It was noted above that the machine, in various guises, has been around for some years, and has sold in large numbers, notably in the US market. Many owners have been modifying and improving machines, and much information is available on the internet. In particular the Frank Hoose site www.mini-lathe.com is most informative and carries a wide variety of links.



2 The lathe has been slid across on to the bench to be bolted down.

Delivery

Two packages (machine and accessories) arrived strapped together via TNT overnight. These were separated after moving into the workshop. Here, the elevating barrow (see article this issue) came into its own, making light of moving the packages from the delivery van along the gravel driveway to the workshop. The lathe comes housed in, and bolted to, the base of a plywood packing case. My



3 Clear indexable dials are fitted to the cross slide and the top slide.

4 The tacho shows the spindle speed.

chosen sequence was to remove the top and one side, **photo 1** then remove the bolts. The barrow platform was then raised so that it became an easy matter to slide the machine across on to the bench, **photo 2** where it was bolted down through the worktop using lengths of M8 screwed rod.

For anyone without such a lifting contraption, 44Kg is more than permitted solo lifting under modern work legislation, but is somewhat less than the old bag of coal or cement. It can be easily lifted by two people. It may also be noted that the machine is supplied with rubber feet. If these are employed then it is not necessary to bolt the machine down, in which case its location may easily be changed.

Initial impressions

For a machine costing so little, there will no doubt be design/production shortcuts but there are also a few unexpected pleasant surprises. Both the crosslide and topslide are fitted with extremely clear indexable dials, **photo 3**. It was mentioned above that the drive is a variable speed DC system, and that the catalogue quotes a minimum speed of 100rpm.

There is also a built in tachometer, **photo 4** and it was found that in low gear, 40rpm was achievable at the lower end of the range. However, as this low speed is obtained by motor control (rather than reduction gears) the transmitted torque will not be massive.

A quick check on headstock alignment was made using a rough and ready method employing a silver steel bar gripped in the three jaw chuck and a clock gauge mounted on the saddle, **photo 5**. This indicated a small error in the horizontal plane (less than a thou over four inches) and nothing measurable in the vertical. This would imply that work held in the chuck and turned nominally parallel will always exhibit a slight taper, of some 0.0002in per in., however this inaccuracy is unlikely to cause difficulties since 1, it is likely that parts made on the machine will not be long, and 2, where this level of precision is needed, finishing would probably be by filing/lapping.

The same set up was also used to look at the accuracy of the chuck and here the run out was one and a half thous at one inch from the chuck jaws, so comfortably less than a thou eccentricity.

Setting a clock to check spindle end float, **photo 6** gave 0.0003in. (applying a load with a small lever) but no measurable movement radially. To examine alignment of the tailstock barrel with the bed, the barrel was first extended to the extent of the graduations and clamped. A clock was then set from the toolpost, **photo 7** and the saddle traversed to move the clock along the extent of the exposed barrel (about 50mm). No measurable deviation was found in either vertical or horizontal planes. Note that this was a check on alignment of tailstock to bed, not of tailstock to headstock concentricity, which may if necessary be adjusted.

It should be noted that ARC do not check or adjust the headstock during preparation, but recommend that this is done by the user once the machine is installed in the final position where it is to be used.

On initially switching on the lathe, at first nothing happened. While I was preparing to decry Chinese quality, the penny dropped that the chuck guard was open, and this is interlocked with the spindle control. Once this was corrected, it sprang into life.

Procedural summary

The following procedure is based on that developed by Arc Euro Trade over several years experience with these lathes. In summary it constitutes a near total strip down, clean, lubricate, rebuild and adjust.

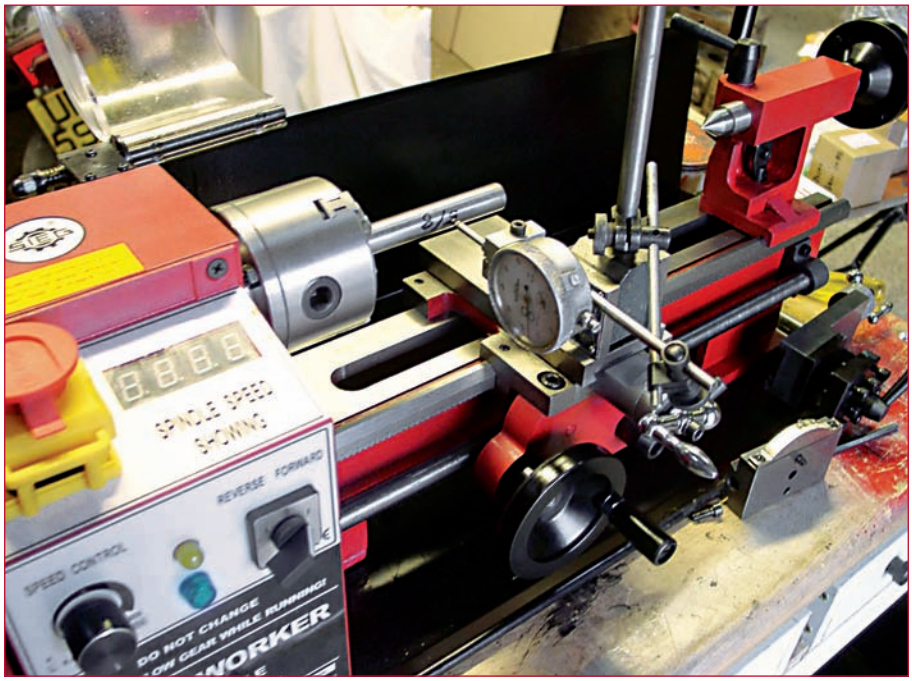
They also modify the leadscrew bearings to facilitate oiling. From my own observation, it seems that the Chinese are extremely generous with the external preservative oil, but not so, where it comes to lubricating hidden parts. Notably, the leadscrew bearings and the apron assembly (gears and bearings) appeared dry. This machine appeared to be coated with a clear, low viscosity preservative, however some are treated with a thicker red concoction, (which ARC jokingly refer to as "Chicken fat").

The essential strip and build work can be carried out using the supplied toolkit (open ended spanners and Allen keys) augmented by a couple of Pozi screwdrivers and a 7mm AF spanner. However, for convenience, I did in some instances use similar items from my own tool box. In addition, while the machine is dismantled, the opportunity may be taken to effect one or two improvements and here one will require either a fine file or diamond lap and also access to a drilling machine for the leadscrew bearing mod.

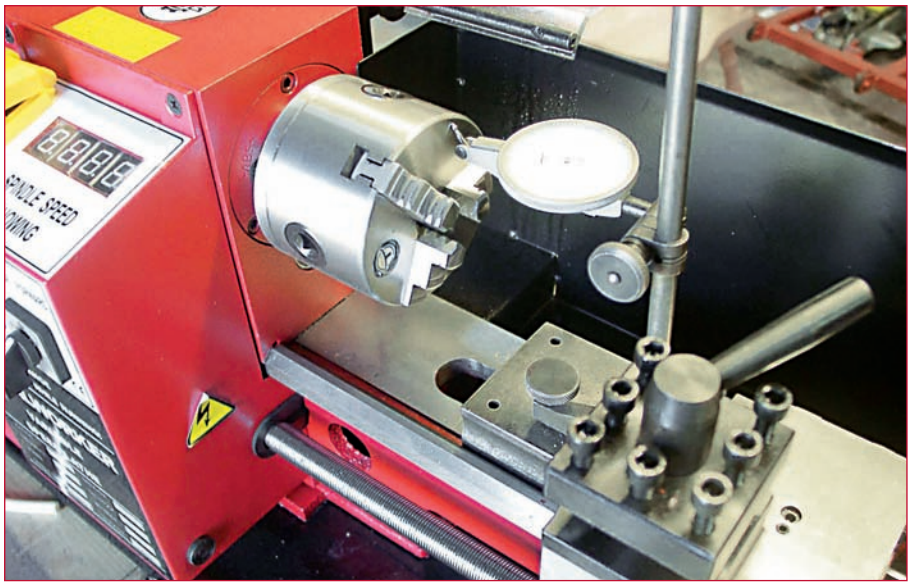
Strip down

The first components removed are the chuck guard, (two Pozi screws), the splash back (more screws) and the change gear cover (two long Allen screws), **photo 8**. With the change gears exposed, it is possible to observe the general alignment of the meshing. As can be seen from **photo 9**, the gear alignment is out by a couple of mm or so, resulting in incomplete contact across the teeth which could lead to premature wear or even breakage. Two solutions may be considered – a) lightly bend the support plate with a lever or b), add a washer at reassembly to bring the assembly into line. I chose the latter course.

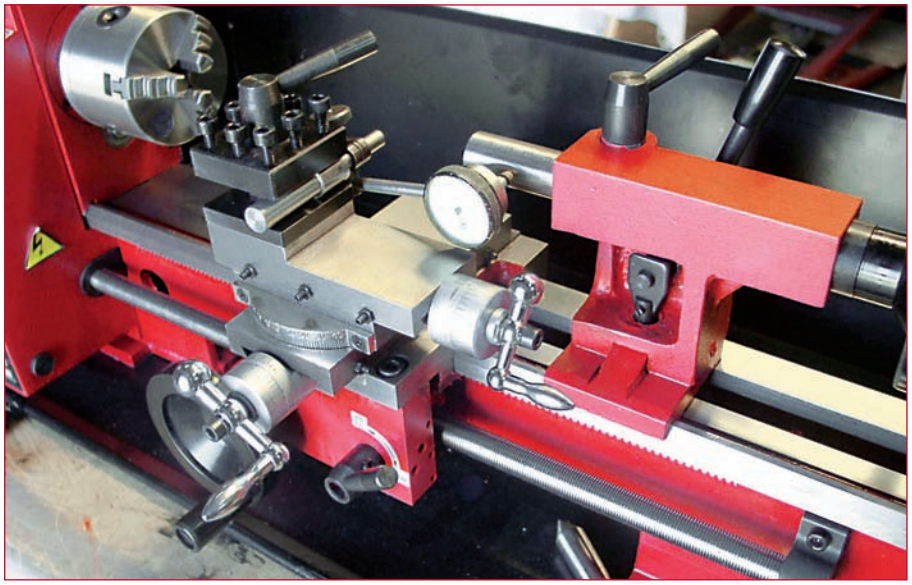
The change wheels are then removed starting with that on the leadscrew, followed by removing the support plate. Then, looking from the end of the lathe, the tumbler assembly may be checked for



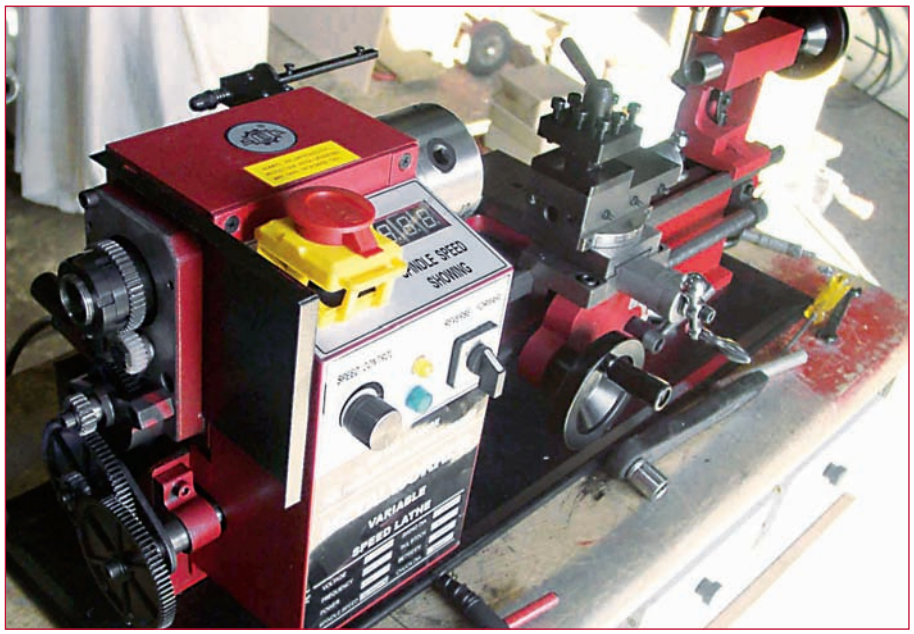
5 Checking headstock alignment and chuck run out.



6 Set up to check spindle end float.



7 Checking tailstock to bed alignment.



8 Chuck guard, splash back and gear cover have been removed.

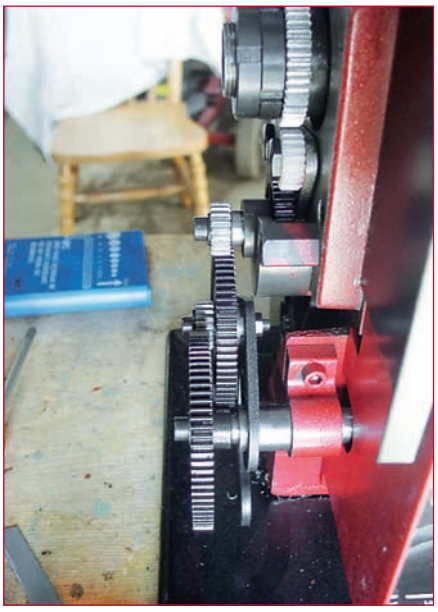
correct action and meshing. In this case it can be seen in **photo 10** that when the tumbler lever is moved to the lower position, contact occurs between part of the lever and a gear carrier casting and that this prevents correct meshing of the tumbler gear. The solution will be to file away a little material from one or both fouling parts.

Once the carrier casting has been detached, the tumbler movement may be rechecked. A second foul is possible between the larger white gear and the washer under the lever retaining screw. **Photo 11** shows that in this case, clearance exists. If there is a foul, it may be possible to encourage the washer sideways with a screwdriver on assembly, or to file a small flat on the washer and carefully align this whilst tightening the screw. The tumbler assembly and alloy belt cover are then removed.

Moving to the rear of the machine, it is then possible to examine the tracking of the motor drive belt. Light contact had been occurring between the belt and the headstock casting. The belt position is determined by the flanges on the motor pulley, so the remedy is to shift the motor slightly in the direction away from the tailstock. It is pivoted between two Allen screws beneath the bed and the operation is simply a case of slackening both locknuts, then undoing one screw and tighten the other. As can be seen from **photo 12**, clearance has now been obtained.

The dismantling procedure then continues with removal of the tailstock, toolpost and, after slackening the gib screws, the topslide moving section. Undoing the two retaining screws then allows the topslide base to be detached. Similarly, the cross slide components are slackened and removed, leaving the saddle and apron in place.

Two Allen screws locate each leadscrew bearing and removal of the one at the tailstock end can be followed by detachment of the apron. With the clasp nuts open, this can be slid carefully along the leadscrew and removed. Before removing the saddle, the six Allen screws on the underside are slackened to give greater clearance. This can then be slid



9 Showing the misalignment of the change wheels.