Like many other turners, I can turn an accurate ball without help from jigs, but there is no denying that a ball-turning jig is a very useful piece of equipment, enabling the manufacture of accurate balls of any given diameter reasonably quickly.

The problem with ball-turning jigs is that if you change your lathe, as I did not long ago, you need a new one unless your new lathe has exactly the same dimensions as the old one, which isn't very likely. My old jig was made from some pieces of 25mm square steel bar, joined together at right angles. A hole drilled at centre height in the upright took a 6mm round-nosed scraper, which was held in place by a screw. To advance the cutting edge, the screw was loosened and the tool pushed further in before retightening the screw.

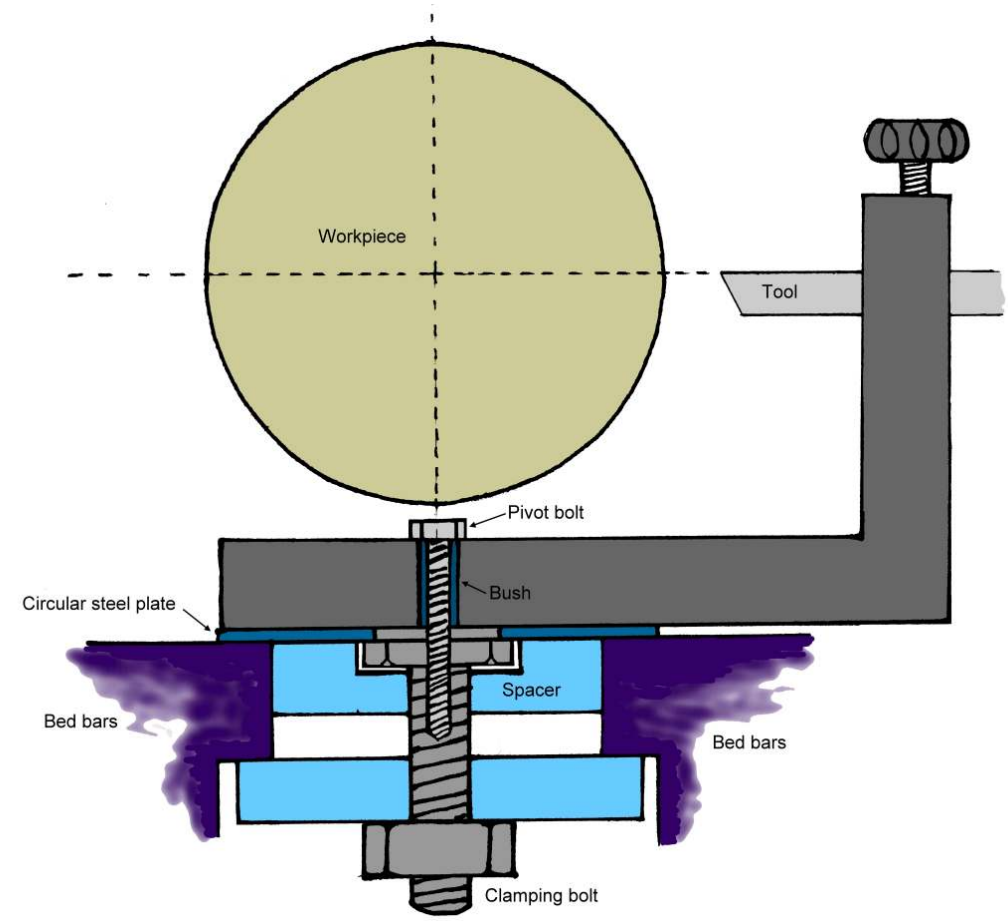

Diagram 1

To allow for large balls, the upright bar had to be some distance from the vertical centre line of the lathe **(diagram 1 and photo 1)**. This meant that when making small balls, the tool was extended a long way without any support. This inevitably led to vibration of the tool which made a smooth, accurate cut difficult to achieve.

Nevertheless, I would probably have made a new version of my old jig had I not seen Bryan, a member of my woodturning club, using a ball jig he had made. What struck me about his jig was that he had incorporated a screw operated slide from a metalworking lathe, making it easier to advance the cutting tool. This seemed an excellent idea, and set me thinking again about the whole design of my new ball-turning jig. Using a slide in this way to move not only the tool, but the whole tool post would make the jig easier to use and, by keeping the tool post close to the workpiece, it should also keep vibration to a minimum.

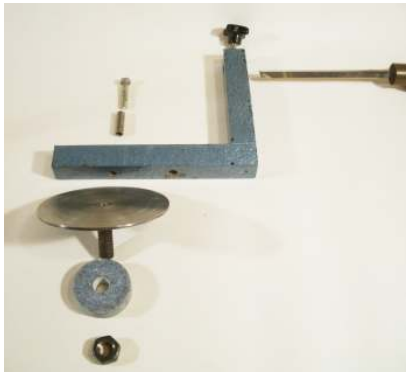

photo 1

As well as a sliding toolpost, I had three other requirements of the new ball-turning jig:

- I wanted to be able to use the jig on either of my two lathes, a Vicmarc 175 on which I do most of my work, and a Vicmarc 100 which I take with me when I'm demonstrating to clubs. These have centre heights of 7" and 5" respectively.
- I also wanted to be able to turn balls up to the maximum size each lathe would allow. The maximum possible radius is equal to the centre height of the lathe less the thickness of the jig over the bed bars **(see diagram 1)**. To accommodate both lathes would mean at least two pivot positions on the jig, one for each lathe.
- The ball jig should be easily adaptable to a new lathe should I ever decide to change either of my Vicmarcs.

I began by looking at the old ball jig for the parts I could re-use. The only useful part was the pivot and clamping arrangement. I had made this by turning down the head of a 12mm bolt to fit a hole in a circular steel plate which I already had. With the bolt securely brazed into the hole, I skimmed the plate to ensure it was perfectly flat, and drilled and tapped another hole in the top of the bolt, ready to take a 6mm bolt which would act as the pivot **(photo 2)**. This arrangement had worked well up to then and I wanted to retain it if possible.

photo 2

For a ball-jig to work correctly, there are two crucial factors: the centre pivot of the jig must lie directly below the centre line of the lathe and the cutting edge of the tool must be at exactly centre height. If either of these conditions is not met the ball will not be spherical, but will be oblong to a greater or lesser extent, depending on how great the inaccuracy is. If your lathe has a swivelling headstock, it is also essential that the headstock and tailstock are correctly aligned.

Working with the small lathe first, I ensured that the pivot was directly under the centre line of the lathe by turning a spacer from Corian which was a tight sliding fit between the bed bars. A 12mm hole drilled in this was enlarged to go over the bolt head and it was superglued to the underside of the metal plate **(photo 3)**. Another piece of Corian was turned and drilled to fit on the bolt under (but not between) the bed

bars. The assembly can then be bolted securely in place anywhere along the bed of the lathe **(photo 4)**.

photo 3

photo 4

The larger lathe has a wider gap between the bed bars, so another piece of Corian was turned to fit over the first spacer and be a sliding fit between the bed bars of the bigger lathe. This was held in place by a large nylon washer which I found in my 'bits box' amongst all the other stuff that will come in useful one day **(photo 5)**.

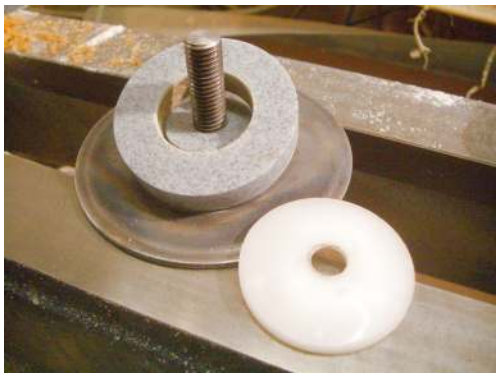

photo 5

The bed bars of this lathe are thicker than the other and a piece of Corian under them would not leave enough of the bolt exposed to take the nut. However, I found another steel plate which I thought would fit under the bed bars but which had a hole in the middle which was too big. To solve this problem I simply superglued a large washer to the plate **(photo 6)**.

photo 6

The assembly would now fit anywhere on the bed of the larger lathe **(photo 7)**.

Bryan had used a screw operated slide which he bought from Axminster, but whenever I think of this sort of item, my mind turns to eBay. I have a Myford ML7 metalworking lathe and I know there is a lively trade in spare parts on eBay.

I soon found a 'top slide' for the Myford **(photo 8)**, and thought that I could always sell it again if things didn't work out. Not only that, but I could temporarily 'borrow' the one from my lathe while I was waiting for it to arrive.

photo 7

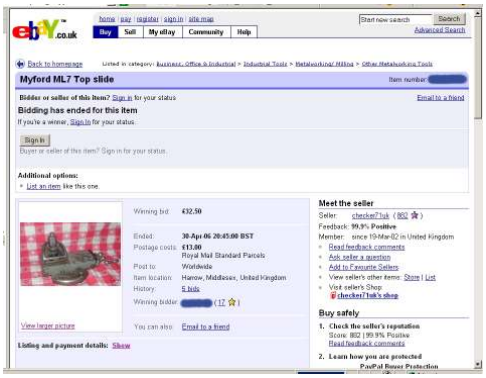

photo 8

Vibration is the enemy of a good ball-turning jig, and I would have liked to have mounted the slide on a steel base. Unfortunately I had no steel plate, nor any means of cutting it even if I had, so I had to make do with a base cut from 19mm plywood. This was shaped to take the Myford top slide **(photo 9)** which was bolted in place through the slots on the slide. This top slide is actually quite heavy and while I was glad because this would help dampen vibration, I was also worried about the strain it might put on the pivot.

photo 9

I decided to make the pivot bush a substantial affair from some 5/8” steel bar I happened to have. I turned a piece to a length just a smidgen more than the thickness of the plywood and drilled a 6mm hole through it. I spent some time working out fixing details and where to put holes in the plywood base so that all ball sizes could be produced on both lathes **(photo 10)**, and then drilled three 5/8” holes with a Forstner bit to make sure they were clean and a good fit for the bush. I also manufactured a very substantial top

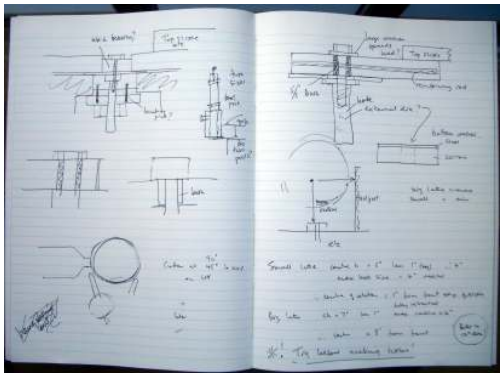

photo 10

photo 11

washer from a piece of 30mm bar **(photo 11)**. With these in place, the plywood base could be fastened down securely, but would still swivel about the pivot screw bush.

To hold the toolpost I welded two pieces of 25mm square steel bar together, after boring out one of them to take a length of round 5/8" bar. The toolpost would be held in place by two screws. **(photo 12)**.The holder could then be gripped in the tool clamp on the top slide **(photo 13)**.

photo 12

photo 13

With the assembly bolted down on the lathe bed, and a length of steel bar in the toolpost holder, the centre height of the lathe was marked from a centre held in the tailstock **(photo 14)**. This was done for both lathes. The toolpost was then cut to length and holes drilled to take the tool, which was ground from an old broken tap. Holes were drilled and tapped at right angles to take securing screws **(photo 15)**.

photo 14

photo 15

Everything could now be put together and the jig was given a trial run. There was still a tiny amount of play in the system, noticeable when set up on the bigger lathe where everything is at full stretch. I wasn't sure whether it was caused by the plywood base flexing, or if it was from the necessary clearance between the pivot bolt and bush. To strengthen the wooden base I attached two strips of steel angle iron, one each side, to

make the base more rigid **(photo 16)**, but it didn't actually make much difference. The

photo 16

photo 17

play is very slight and doesn't prevent a highly accurate ball being turned. It's certainly a great improvement on the previous version, and I am very happy with the final jig **(photo 17 and below)**.

Postscript:
In use I later found that the jig's central pivot screw tended either to work loose or tighten up as the jig was rotated in one direction or the other. To overcome this I screwed and superglued a longer bolt into the central hole (refer to photo 2) so that I could fasten the base down with a washer and two nuts screwed down from above. With this arrangement I could use one nut to lock the other in place. This solved the problem.

This solution was suggested to me by a retired engineer at a demo I was giving. I don't know his name but If he reads this, I'm indebted! Thanks.